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# UNITED STATES NAVAL MEDICAL BULLETIN

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NAVY DEPARTMENT,  
*Washington, March 20, 1907.*

This UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the Department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,  
*Acting Secretary.*

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## PREFACE

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The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April 1907 as a means for supplying medical officers of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine, descriptions of suggested devices, clinical notes on interesting cases, editorial comment on current medical literature of special professional interest to the naval medical officer, and reports from various sources, notes, and comments on topics of medical interest.

The Bureau extends an invitation to all medical and dental officers to prepare and forward, with a view to publication, contributions on subjects of interest to naval medical officers.

In order that each service contributor may receive due credit for his efforts in preparing matter for the BULLETIN of distinct originality and special merit, the Surgeon General of the Navy will send a letter of commendation to authors of papers of outstanding merit.

The Bureau does not necessarily undertake to endorse all views or opinions which may be expressed in the pages of this publication.

P. S. ROSSITER,  
*Surgeon General, United States Navy.*

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## NOTICE TO SERVICE CONTRIBUTORS

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Contributions to the BULLETIN should be typewritten, *double spaced*, on plain paper, and should have wide margins. Fasteners which will not tear the paper when removed should be used. Nothing should be written in the manuscript which is not intended for publication. For example, addresses, dates, etc., not a part of the article, require deletion by the editor. The BULLETIN endeavors to follow a uniform style in heading and captions, and the editor can be spared much time and trouble, and unnecessary changes in manuscript can be obviated if authors will follow in these particulars the practice of recent issues.

The greatest accuracy and fullness should be employed in all citations, as it has sometimes been necessary to decline articles otherwise desirable because it was impossible for the editor to understand or verify references, quotations, etc. The frequency of gross errors in orthography in many contributions is conclusive evidence that authors often fail to read over their manuscripts after they have been typewritten.

Contributions must be received 2 months prior to the date of the issue for which they are intended.

The editor is not responsible for the safe return of manuscripts and pictures. All materials supplied for illustrations, if not original, should be accompanied by reference to the source and a statement as to whether or not reproduction has been authorized.

The BULLETIN intends to print *only original articles, translations, in whole or in part, reviews, and reports and notices of Government or departmental activities, official announcements, etc.* All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without an understanding to that effect.

# U.S. NAVAL MEDICAL BULLETIN

VOL. XXXII

JANUARY 1934

No. 1

## SPECIAL ARTICLES

### GONORRHEAL EPIDIDYMITIS

By R. P. PARSONS, Lieutenant Commander, Medical Corps, United States Navy

Epididymitis is the commonest complication of the Navy's commonest disease, there being annually about 1,000 cases with a total of about 30,000 sick days.

While no important advance has ever been made either toward preventing epididymitis or hastening recovery from it, a sound knowledge of some of its clinical features should, if applied, result in a lower incidence, a more comfortable patient, and a very considerable reduction (about 50 percent) in sick days.

It was with particular reference to the subject of sick-days that a close study of 100 consecutive<sup>1</sup> cases admitted on board the U.S.S. *Relief* between January 1, 1932, and June 1, 1933, was undertaken. An analysis of this group of cases is presented below.

Before entering on the analysis some general comments on gonorrheal epididymitis should be in order.

Regarding pathogenesis there is no longer any doubt that it results from the passage of infective material down the vas. Whether this occurs frequently, or at all, by urine traversing the ejaculatory duct, seminal vesicle, and vas is an unsettled question. I have yet to see a case of epididymitis without an accompanying (though often mild) prostatitis and seminal vesiculitis and believe that epididymitis is not possible without a preceding seminal vesicle infection. The vas is not necessarily involved by passage of gonococci through it to the epididymis.

Any case management that minimizes the probability of prostatitis and seminal vesiculitis will consequently minimize the probability of epididymitis. The modern practice of routine vasectomy prior to prostatectomy or other prostatic operations for the purpose of preventing post operative epididymitis has suggested the advisability of routine vasectomy at the onset of gonorrheal urethritis for

<sup>1</sup> This group is not strictly consecutive. There were a few occasions of general evacuation of the *Relief* patients to naval hospitals during this period. Cases of epididymitis included in these evacuation groups were excluded from the study since they could not be followed and observed throughout the course of the disease.

the same purpose. Considering the simplicity of vasectomy and its effectiveness in preventing epididymitis, this would be a fine idea except that it would tend to result in sterility.

As for predisposing causes, unusual physical exertion appears to play a very definite and frequent role. In this series there were 10 cases in which the onset followed within 24 hours of unusual physical exertion. In three others there was history of trauma to the testicle but the trauma story is an old favorite and cannot be taken too seriously. In one there was history of excessive sexual indulgence. Alcohol is known to be an important factor but with restriction of liberty during the early weeks of the disease (when two thirds of the epididymitis complications arise) it scarcely needs consideration in the Navy. Urethral instrumentation, especially during the first 2 months, was formerly a very potent factor, but in recent years, thanks largely to the admonition of Pelouze and others, this factor is becoming rare. In none of this series was there history either of instrumentation or alcohol. It is believed, however, that many of these patients were receiving injections too frequently or too forcibly and of a solution of too great strength. One injection per day of strength not exceeding 0.5 percent protargol is now widely considered as sufficient. Particularly with signs of impending acute posterior urethritis and prostatitis (sudden cessation of discharge, fever, chill, dysuria, terminal hematuria) it is important to discontinue local urethral treatment and put the patient at complete rest.

When all is said and done, even with the most ideal management and with every known precaution taken, it is felt that fully three fourths of the cases will be inescapable. The incidence of epididymitis has long been known to be a figure of only slight variations, and the incidence of gonorrhea for any community or ship can be quite accurately computed by multiplying the epididymitis figure by eight. In other words, the complication of epididymitis occurs in about 12 percent of any large group of gonorrheas receiving various forms of treatment.

Unfortunately, the figures for epididymitis were not listed separately in the Annual Reports of the Surgeon General for periods prior to the calendar year 1930. Those for the last 3 years are as follows:

	1930	1931	1932
Original admissions for gonorrhea.....	8,518	8,630	8,875
Epididymitis (admitted and admitted contributory disease).....	1,194	1,101	1,216
Percent incidence.....	14.0	12.7	13.7

The incidence figures given above are slightly higher than those given in the preliminary sections of the annual reports since those tables included only the cases in the "admitted contributory disease" column. The figures given above include the cases in the "admitted" column as well as the "admitted contributory disease" column because obviously epididymitis cannot occur without a preceding urethritis. The figure in the "readmitted" column was not included since this would confuse the issue and would give the appearance of a larger proportion of gonorrhea patients developing epididymitis than is actually the case. The figure in the "readmitted" column simply expresses the proportion of epididymitis patients who had recurrent attacks. This proportion (assuming only two attacks for each case reported under readmitted) was as follows (in percentage):

1932.....	18
1931.....	18
1930.....	19
Series of 100 cases here reported.....	24

As for treatment, fads too numerous to mention come into vogue only to be discarded just as rapidly. Testicular support is of course necessary for the patient's comfort. Among the various methods, the common suspensory is by far the most comfortable and convenient, as it permits walking when, after the first 3 or 4 days, patients are usually ready for short ambulatory periods. In cases of the lower grades of inflammation many patients never need take to bed, and for these the suspensory is a great help. Adhesive-strap bridges are uncomfortable and serve no purpose except when the patient is prone. The rigid suspensory of adhesive strapping is also objectionable on the grounds of discomfort and because it interferes with walking. The Navy suspensory, even the largest size, is very often found too small. In such cases the band above the penis may be cut and if it is still too small, a home-made suspensory can be easily constructed with a piece of muslin or gauze, held in place by an adhesive strap across the abdomen.

Ice bags and heat pads sometimes decrease the pain in the more acute stages and may be tried. Applications, such as lead and opium lotion or guaiacol and ichthyol are often used in the Navy but in addition to having no virtue as pain relievers in epididymitis, they are messy and constitute nothing more than an additional nuisance.

About 8 years ago Dr. Corbus introduced a diathermy clamp for applying a diathermy current to the epididymis. It impressed many urologists at the time and was a distinct help in easing the pain. It was also thought at first that it hastened resolution and thus decreased the sick days. It is still in almost routine use on the *Relief*. In the series to be reported 65 were treated with it

and 35 without it. Those treated without it averaged 12.2 sick days; those with it 14.8 sick days. And while this tends to show that there is no essential difference in the number of sick days with or without diathermy, no conclusions should be drawn here because the two groups were not exactly comparable. In general, diathermy was given in the more severe cases.

In the chronic cases or in those of repeated recurrence epididymectomy is strongly indicated as it is usually the only method that can assure permanent cure. It was done seven times in this series. The operation is much more difficult and time consuming than an appendectomy and there is always the danger of the loss of a testicle, but it is a procedure of great value in selected cases. It should never be done during an acute inflammatory period. Short histories of the seven cases mentioned are given later.

For many years this writer has been at a loss to account for the excessive average number of sick days per case of epididymitis in the Navy. This average has remained at about 25 days, whereas among the cases observed personally the sick days have seldom been more than 15.

The average for the series reported here was 13.9. Moreover—and this is a point of the utmost importance in placing an accurate interpretation on the data—these 100 cases represent in general a group of the most severe cases that occurred in the fleet for the 18 months' period. Obviously, the cases transferred to the hospital ship were, as a rule, the ones where some unusual trouble was either at hand or expected and where prolonged illness was looked for. So far as known, none of the medical officers (with one exception) made it a routine practice to send all cases of epididymitis to the *Relief*. The ship in question sent twice as many cases as each of several other battleships of equal complement. If this ratio can be taken as an index, then the *Relief* received what was considered by the various medical officers in the fleet as being the more troublesome half of the cases.

The Navy figures given below were obtained by adding the figures in the D and C columns for gonococcus infection of epididymis. This total is approximately equal to the total obtained by adding the figures in the admitted, admitted contributory diseases, and readmitted columns.

	1932	1931	1930	<i>Relief</i> series
Cases.....	1,435	1,407	1,329	100
Sick days.....	33,504	35,742	31,261	1,390
Average per case.....	23.3	25.4	23.5	13.9



In examining health records and questioning patients who had been on the sick list elsewhere for previous attacks of epididymitis I was impressed by three different factors which appear to be largely responsible for the sick days that are far in excess of those needed. These factors are as follows:

1. Retention on the sick list awaiting further reduction in the size of the epididymis, although all tenderness, pain, fever, and other disabling symptoms have disappeared. Within about 3 days of the disappearance of the tenderness it is quite safe to permit a patient to return to duty, although the swelling and induration may not reach their minimum stage for a matter of several weeks. An indurated nodule may even persist throughout life. This rule may rarely result in a recurrence that would otherwise be avoided, but for the mass the 3-day rule is quite safe and humane, working great benefit to the ship's organization when the man's services are needed. It is well to try the patient out on light duty about the ward for a day or two before deciding that he is fit for regular duty. The man's rate should also be given consideration in this matter. A yeoman or radioman can return a day or two earlier than one whose work involves considerable physical exertion. The white count is often helpful in deciding the date for duty. When it returns to 8,000 or lower, the acute stage can usually be considered as passed, although one case was observed where it remained over 15,000 for 3 months after the patient returned to duty, due to sub-acute prostatic infection.

2. Chronic and recurrent cases. Some very nice decisions are called for in this class in selecting the cases for operation. Good judgment in this matter can only come from long experience. The case histories given below are fairly typical of the class that needs operation. Some of them illustrate quite well the needless number of sick days before operation.

CASE 14.—C. S. A. had gonorrhea in April 1931. Developed right epididymitis in October 1931 and spent 87 days on sick list because of slow subsidence and recurrence. Developed left epididymitis March 23, 1932, and was admitted to *Relief*. Left epididymis then swollen to size of tennis ball. Left vas indurated and enlarged to about four times normal thickness. Epididymis well subsided by April 8, when he returned to duty. Readmitted to *Relief* April 13, with no recurrence of left epididymitis and no increase in swelling but complaining of constant dull pain in left scrotal contents. The enlargement was then only slight but there was some tenderness and considerable induration and it was thought that acute recurrences would appear unless operated. Epididymectomy, left, April 15; to duty April 29. Seen one year later when admitted with head injury. No further trouble.

CASE 16.—W. E. H.—Gonorrhea in 1924 and 1934, second infection being complicated by right epididymitis (9 sick days). Syphilis in January 1931.

Recurrence of right epididymitis April 1, 1932, and admitted to *Relief*. Right epididymis swollen to size of hen's egg and very tender. Right was about four times normal thickness. Epididymis well subsided by April 15, when epididymectomy was done. To duty April 25.

CASE 17.—D. W.—Gonorrhea in October 1931 complicated by right epididymitis, causing 43 sick days. Occasional pain since then but no acute recurrence until April 8, 1932, when admitted to *Relief*. Right epididymis swollen to size of tennis ball; right hydrocele. Right seminal vesicle large and indurated. Epididymis fairly well subsided by April 18 when epididymectomy was done. To duty May 6, 1932.

CASE 35.—W. H. H.—Gonorrhea in 1920 and January 1930; second infection being complicated by acute prostatitis, causing 25 sick days. Had dull, perineal pain for about 1 year. Developed left epididymitis in October 1931 and remained on sick list 93 days. Returned to duty in January 1932, but perineal pain and left testicular pain continued. Painful and premature ejaculations for 1 year. Admitted to *Relief* June 1, 1932. Left epididymis enlarged to about half the size of a golf ball. Left vas thickened. Prostate boggy and tender. Seminal vesicles large and tender. Prostatic and vesicular fluid pus laden. Urines hazy with countless shreds. Endoscopy showed moderate congestion about verumontanum. Left epididymectomy June 2. Argyrol injected to each seminal vesicle at time of operation. Wound healed June 10 but retained until 24th for prostatic massage and urethral dilatation. Urine clear and complained of no pain when returned to duty.

CASE 58.—L. M. J.—Gonorrhea in February 1927. Second infection in February 1929, followed in 2 weeks by left epididymitis which caused 26 sick days. Rather large lump remained after recovery from acute attack. Recurrence in May 1929 with 40 sick days. Next recurrence in February 1930, causing 116 sick days. He states that the third admission was prolonged largely because of hydrocele, which was tapped but not operated on. Next recurrence in April 1931. States that swelling subsided in about 1 week, but remained on sick list 51 days. Total sick days charged to epididymitis is 189. Left hydrocele increased rapidly in size in July 1932 and was admitted to *Relief* August 1, 1932. Left epididymis was hard, nodular, and about size of hen's egg. Left hydrocele of 200 cc content. Left vas thickened. Left epididymectomy and hydrocelectomy done August 4. Wound healed August 15, but patient retained for prostatic treatment and antiluetic treatment. If operation had been done in June 1929, about 150 sick days could have been saved.

CASE 64.—R. R. J.—Gonorrhea in September 1929; complicated in a few days by left epididymitis, which occasioned 18 sick days. One year later had right epididymitis, which caused 10 sick days. Left epididymitis recurred September 14, 1932, when patient was admitted to *Relief*. Left epididymis then swollen to size of golf ball, indurated, non tender. Left vas thickened. Condition became more acute on September 17, but was well subsided by September 27 when epididymectomy was done. Wound healed October 2 and to duty October 7. This case was only "charged" with 10 sick days in the table that follows because the acute stage had subsided by September 25 and he could have returned to duty then "to await the next attack."

CASE 66.—L. V.—Not an operative case, but included here because of certain interesting features. Had gonorrhea in 1927. Otherwise well until September 19, 1932, when admitted to *Relief* with diagnosis of appendicitis, acute. Complained of vertigo, nausea, and pain in right lower quadrant on admission. Examination showed tenderness and rigidity over right lower quadrant. Temperature, 100.2; pulse, 118; W.B.C., 34,150; 91 percent polys. Patient did not notice urethral discharge until arrival on *Relief*, and examination on ar-

rival showed a beginning right epididymitis, with epididymis enlarged to size of golf ball. Returned to duty, epididymis well subsided, on October 7, 1932.

CASE 67—M. D. F.—Nonoperative, but unusual case. Gonorrhea in April 1931. Apparent complete recovery without complications. Acquired syphilis in September 1931. Urethral discharge reappeared August 20, 1932, and left epididymitis developed the next day, subsiding 2 weeks later. Admitted to *Relief* on September 23 with beginning right epididymitis. On admission right epididymis was enlarged to size of golf ball, indurated and very tender; overlying scrotum edematous and reddened. Right seminal vesicle markedly swollen and tender. Temperature rose every day for 10 days, rise ranging from 101 to 104.2. Complained of muscular and joint pains from September 25 to October 1, but there was never any joint swelling. Epididymis well subsided by October 2. Developed jaundice on October 3, which cleared in about 3 days. Recurrence of right epididymitis on October 12 and the question of operation was considered, but it was decided that this could be postponed until a later period when his general condition would make him a better subject for operation. Epididymis subsided by October 20 and patient was allowed to return to duty. In what way, if any, the jaundice was associated with the epididymitis is not known. This offers much room for speculation. If the patient had returned later with another recurrence, epididymectomy would have been done. He has not been heard from since returning to duty.

CASE 79 AND 87—B. J. R.—Gonorrhea in September 1931, complicated in October 1931 by bilateral epididymitis, causing 29 sick days. Recurrence of urethral discharge in December 1932 and recurrence of left epididymitis on January 12, 1933. Admitted to *Relief* January 14, 1933. Left epididymis then swollen to size of hen's egg, tender, indurated, overlying scrotum markedly edematous and reddened. Complete subsidence and return to duty on February 3. Readmitted to *Relief* March 3 (Case 87) with right epididymitis after 1 month of freedom from symptoms. Right epididymis swollen to size of walnut. Right vas thickened. Right epididymis subsided by March 6 and epididymectomy done March 7. To duty March 17. No further trouble.

*Summary of 100 cases of epididymitis*

Right side.....	50
Left side.....	47
Bilateral .....	3

*Previous attacks.*—Twenty-four patients with thirty-three previous attacks which totaled 863 days (average 26.1 days per attack).

*Time of attack after original onset of urethral infection*

One eighth of cases:		One half of cases—Continued.	
First week.....	13	Fifth month .....	1
Second week .....	9	Sixth month .....	1
Third week .....	4	Two thirds of cases:	
Fourth week.....	8	First 6 months.....	64
One third of cases:		Second 6 months.....	13
First month.....	34	Three fourths of cases:	
Second month.....	15	First year .....	77
One half of cases:		Second year.....	16
First 2 months.....	49	Third year.....	6
Third month.....	10	Fifth year .....	1
Fourth month.....	3		

*Sick days*

With diathermy (65 cases, average 14.8 days)-----	954
Without diathermy (35 cases, average 12.2 days)-----	439
Total (100 cases, average 13.9 days)-----	1,393

## CONCLUSIONS

1. One hundred consecutive cases of gonorrheal epididymitis admitted on the *Relief* between January 1, 1932, and June 1, 1933, are presented and analyzed.

2. It is believed that the Navy case remains on the sick list, on the average, about 10 days longer than need be.

3. This needless prolongation of sick days is due in part to (a) awaiting further decrease in swelling after other symptoms (pain, tenderness, scrotal reddening, fever, and leukocytosis) have disappeared; (b) undue delay in operating on (or failure to operate on) chronic and recurrent cases.

4. Since three fourths of the cases occur during the first year of the disease, that proportion of the patients is in a pay-checkage status while on the sick list. This accentuates the necessity of returning the patient to duty at the earliest day possible.

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**TREATMENT OF THE CHINESE WOUNDED AT A BASE HOSPITAL IN  
PEIPING, CHINA**

By M. D. WILLCUTTS, Lieutenant Commander, Medical Corps, United States Navy

In the Sino-Japanese conflict in North China, following the conquest and occupation of Jehol, the Great Wall and North China up to the very gates of Peiping, an armistice was signed at Tangku. The conflict started on New Years Day, 1933, at Shanhaikuan, where the Great Wall of China meets the Yellow Sea. Guns, tanks, aerial bombs, and warships were employed by Japan. Three days later Shanhaikuan fell, on section little more than a smoking ruin. The Japanese Army then took Chiumenkuo Pass, then Jehol, the Great Wall and penetrated deeply south to the environs of Peiping.

By the last of February many wounded soldiers and refugees were arriving in Peiping. At the close of the first week in March the proper care of the Chinese wounded became a very serious problem. I suggested to United States Minister Johnson and my commanding officer, Colonel Gulick, that I should observe the professional work done for the Chinese wounded. They both concurred. Dr. S. T. Wang, medical superintendent of the Peiping Union Medical College, was organizing a base hospital near that college in the Shuai Fu Yuan barracks and I was appointed "Honorary Surgeon."

Chart I shows the daily hospital census of wounded patients from March 8 to June 1, 1933.

Chart 1

	Number of patients		Number of patients		Number of patients
Mar. 8.....	30	Apr. 1.....	516	May 1.....	385
Mar. 9.....	57	Apr. 2.....	513	May 2.....	401
Mar. 10.....	130	Apr. 3.....	511	May 3.....	408
Mar. 11.....	291	Apr. 4.....	511	May 4.....	407
Mar. 12.....	388	Apr. 5.....	403	May 5.....	407
Mar. 13.....	434	Apr. 6.....	403	May 6.....	406
Mar. 14.....	433	Apr. 7.....	409	May 7.....	406
Mar. 15.....	432	Apr. 8.....	421	May 8.....	404
Mar. 16.....	448	Apr. 9.....	421	May 9.....	365
Mar. 17.....	448	Apr. 10.....	371	May 10.....	363
Mar. 18.....	437	Apr. 11.....	367	May 11.....	365
Mar. 19.....	463	Apr. 12.....	377	May 12.....	221
Mar. 20.....	474	Apr. 13.....	374	May 13.....	221
Mar. 21.....	492	Apr. 14.....	370	May 14.....	211
Mar. 22.....	511	Apr. 15.....	373	May 15.....	216
Mar. 23.....	511	Apr. 16.....	375	May 16.....	259
Mar. 24.....	509	Apr. 17.....	379	May 17.....	177
Mar. 25.....	519	Apr. 18.....	380	May 18.....	271
Mar. 26.....	518	Apr. 19.....	381	May 19.....	281
Mar. 27.....	514	Apr. 20.....	386	May 20.....	285
Mar. 28.....	517	Apr. 21.....	383	May 21.....	87
Mar. 29.....	517	Apr. 22.....	395	May 22.....	97
Mar. 30.....	515	Apr. 23.....	378	May 23.....	184
Mar. 31.....	517	Apr. 24.....	378	May 24.....	208
		Apr. 25.....	381	May 25.....	255
		Apr. 26.....	382	May 26.....	258
		Apr. 27.....	361	May 27.....	260
		Apr. 28.....	355	May 28.....	259
		Apr. 29.....	357	May 29.....	269
		Apr. 30.....	365	May 30.....	263
				May 31.....	262
Total hospital admissions.....				1,269	
Total first and secondary dressings.....				33,957	
Total operations requiring general anaesthesia.....				1,077	
Total deaths.....				41	

Authoritative sources place the number of wounded soldiers treated in Peiping alone as close to 5,000. Estimates of the total Chinese casualties vary widely and are difficult to determine. A popular estimate is 12,000 killed and wounded. Evacuation of the seriously wounded was almost hopeless at the front. Returning wounded soldiers reported that they represented only one third of the total casualties; that the remaining two thirds had been left dying or dead at the front.

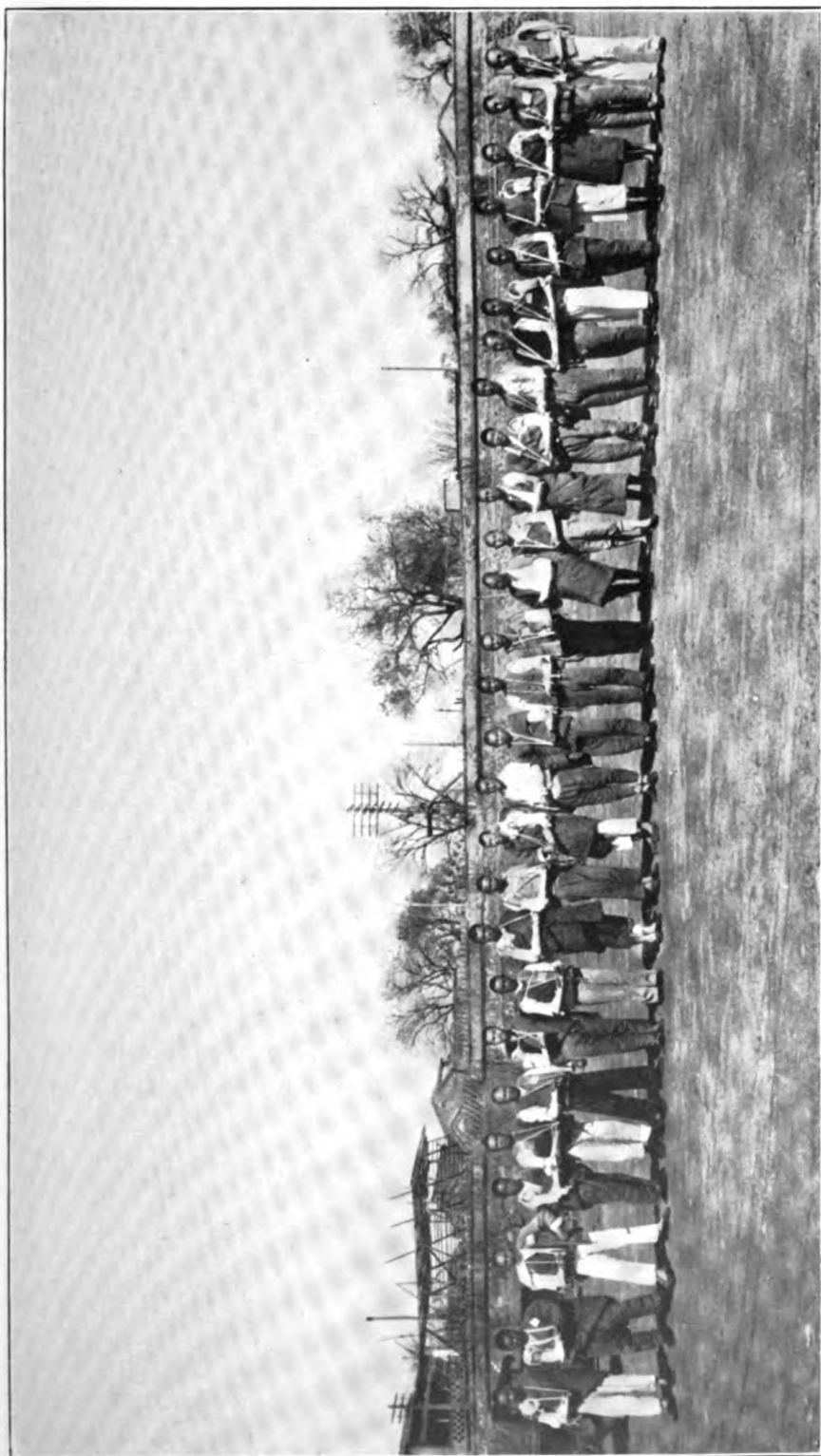
The hospital staff consisted entirely of Chinese medical students, internes, and doctors on rotary detail from the Peiping Union Medical College. The purpose of the hospital was dual; first, care of

the wounded, and second, the training of senior medical students and internes for field work at the front. Dr. S. T. Wang headed the organization as superintendent. The hospital was under the immediate charge of Dr. Amos Wong and Dr. C. M. Meng. The surgery was equipped with 2 operating tables. The senior medical students and residents from the Peiping Union Medical College were assigned wards and given rotary positions on operating teams. The proximity of the Peiping Union Medical College permitted invaluable consultations and help for special head and neurological wounds.

Starting from an empty dirty barracks, it was amazing how speedily the hospital was able to function. Supplies and equipment were limited and often wanting. The resourcefulness and cleverness of the Chinese staff were remarkable. Empty gasoline cans were rigged up with spouts as containers for running water with which to scrub up. Crude but efficient dressing and instrument trays were made from light wood. Chinese coal stoves for boiling water; solutions of bichloride of mercury, phenol, and alcohol were the only means for sterilization. Gowns, gloves, and operating linen were changeable only at close of day. During peak loads, the same gown might function throughout the week. Chemical rinsing of hands constituted our scrub-up technique between cases. Dressing, bandages, and towels were strictly and sparingly limited, the number per case being specified by written orders. The orthopedic appliances made by Dr. Meng deserve special mention. Thomas, Jones, and skeletal traction splints were cleverly and cheaply constructed from light iron. Artificial peg legs were made from wood, plaster, and leather at cost of less than \$1.

Despite the apparent crudeness of this equipment, a very efficient organization was established and maintained. Students and young doctors were trained in emergency surgery and anesthesia. Their Peiping Union Medical College training proved a splendid foundation and proficiency was rapidly obtained. One thousand and seventy-seven operations were performed under chloroform anesthesia with no immediate fatality or accident. The work was divided between the two operating tables, both functioning at the same time. This permitted a rapid turnover of patients, which produced a stream of incoming and outgoing patients carried by litter bearers with surprising smoothness and teamwork.

*Type of patients.*—The North China soldier rates a much higher military mark than his reverses of the past few months might indicate. Authentic battle stories reveal no lack of personal courage, physical endurance, and a high patriotic spirit when fighting a foreign enemy. Only those wounded by aerial bombing gave evidence of broken spirit.



GROUP OF GUNSHOT FRACTURES. CHINESE BASE HOSPITAL. MAY 1933.





The wounded we treated were young, and in most instances, finely developed men. They were orderly and well behaved. All were free of active venereal disease. Most were admitted in a state of exhaustion with badly soiled clothing and dirty bodies heavily infested with lice.

*Classification of wounds*

Head and neck.....	152
Loss of eyes.....	5
Chest.....	102
Abdomen.....	39
Back.....	25
Pelvis.....	20
Upper extremities without fracture.....	259
Lower extremities without fracture.....	314
Fractures upper extremities.....	115
Fractures lower extremities.....	81
Frostbites.....	41
Tetanus.....	4
Miscellaneous.....	112

Machine-gun and rifle-fire wounds predominated. Shrapnel and aerial-bomb wounds were common throughout the campaign. Later, during May, bayonet and sword cuts with frequent powder burns gave evidence of close fighting. There were no victims or evidence of chemical warfare. A majority of the wounds were through-and-through bullet wounds with small sharply defined point of entrance and large jagged exit. The wounds were invariably infected, many teeming with maggots. Severe intracranial injuries seldom survived to reach the base hospital. A few ghastly exposed brain wounds did arrive only to expire a few days later from meningitis. The majority of severe chest and abdominal wounds died at the front. Penetrating wounds of the chest rapidly progressed to pyohemothorax necessitating rib resection for adequate drainage.

Transportation of the wounded was chiefly by truck and carts and where possible by troop trains. Unquestionably many serious wounds became fatal from lack of early care and adequate transportation facilities. During March 41 cases of frozen extremities were received. Here again delayed and inadequate facilities for evacuation of the wounded resulted in severe frostbites and gangrenous lesions of hands and feet. The weather in Manchuria was severely cold and exposures following wounds were often severe and prolonged. Gratifying salvage of apparently hopeless gangrenous forearms, hands, ankles, and feet rewarded expectant conservative nursing measures. The dead parts were permitted to separate spontaneously. A black, cold, apparently lifeless limb recovered often with loss of only toes and fingers or superficial slough.

Direct hits to arms and legs from rifle and machine-gun fire carried a high incidence of fractures. They were usually severe, compounded, comminuted, and were always infected. Great credit is due Dr. C. M. Meng for his ingenious construction of modified Jones and Thomas splints, which permitted open treatment of the infected wounds coincident with fixation of the fracture. Minor infections did not prevent primary union of fractures. Major infections with loss of bone and soft tissue often developed huge pus cavities that finally necessitated amputation. Limited hospital facilities and war economy curtailed secondary plastic operations. Amputations for severely infected un-united fractures became an economic procedure. Figure 1 shows a group of gunshot fractures of the upper extremities. •

Mutilating wounds were frequent and often startling from shrapnel or aerial bombs. Many cases presented great areas of soft tissue literally blown away and usually associated with fracture. The dreaded gas infection and gas gangrene occurred but with surprising absence of the usual clinical symptoms. Routine cultures of necrotic tissue showed a high incidence of *Bacillus Welchii*. Cases with gangrenous emphysema, the gas bubbles rising within muscle sheath and along fascial planes, were noted without alarming constitutional symptoms. Treatment was limited to debridement, free incision for adequate drainage, and modified Carrel-Dakin technique (modification due to limited facilities). This sufficed to control the infection; rarely was amputation necessary.

Infected hematomas from tortuous bullet tracts were always serious. Three died from uncontrolled secondary hemorrhages. A fourth case survived following amputation of the thigh as a hemostatic measure.

*Maggots.*—A number of cases delayed in reaching the hospital presented wounds teeming with maggots. As noted in the World War, and in keeping with the maggot therapy for chronic osteomyelites, the wounds when cleared of maggots presented healthy granulations and were certainly none the worse for the infestation.

*Tetanus.*—The Chinese Army is well indoctrinated in the use of tetanus antitoxin serum and its administration is a routine procedure following all wounds at the front. It is interesting to note that of the 500 patients entering the base hospital in March, 90 percent, or all but 50 cases, had received the serum. In April (many new medical units had been established at the front) not one case admitted to the hospital had failed to receive the serum. In May with the rapid advance of the Japanese Army, the Chinese occupied new positions nearer Peiping with quicker access to the base hospitals. Under these conditions 300 or about 75 percent of the

patients required the serum upon admission. Four cases of tetanus were treated at this hospital; three died.

*Lice.*—As in the World War the body louse infested all. Bathing facilities were almost entirely lacking and the heavy clothing required on the northern front proved an ideal habitat for the body louse. Sanitary conditions were most limited. A delousing plant was established at the base hospital but reinfestation was almost impossible to control. The menace of epidemic typhus was ever present. Sporadic cases developed, but failed to spread. One of the doctors was stricken late in May and is now seriously ill in high delirium at the Peiping Union Medical College (June 12, 1933).

*Anesthesia.*—Chloroform was the anesthetic routinely employed. The students were readily trained and at no time did anesthesia become a serious problem. There were no anesthetic deaths; no accidents. Local anesthesia was employed in only a very few instances, as the wounds were infected and the absence of bathing facilities rendered extensive sterile regional exposures difficult. The ease and rapidity of administering chloroform and the almost immediate recovery from its effects were factors that outweighed traditional dangers.

The campaign was marked by lulls through which the hospital continued active; occupied with reclassification of the wounded and their systematic grouping into special wards. A large number required secondary operations for control of extending infections and the removal of foreign bodies. March passed. Our early cases were now being discharged; those physically fit returned to the front. April brought more fighting, territory south of the Great Wall was being invaded. Our daily hospital census remained almost constant as new admissions kept pace with the number of discharges. May came. Fresher wounds were noted, many only a few hours old. Trucks, carts, and jinrickishas brought them in. The Japanese drive now threatened Peiping. Air raids at Hsi-Feng-Kou and again at Chi Hsien gave tragic proof of the nonsanctity of hospitals against aerial bombing. The occupation of Peiping became hourly expected. Japanese planes made warning visits over the city. Neighborhood villages were occupied. Heaps of sand-bags were placed at strategic points about the city. The city walls were manned by anti-aircraft defense. Five civilians were injured in the heart of the city by falling shell fragments directed against Japanese planes. The situation became so tense by May 20, 1933, that orders came to classify patients for evacuation. By the 22d, all but 87 had been transferred on motor trucks to the south. The following day the Japanese Legation was reinforced by several hundred troops that arrived by train from Tientsin. Refugees by the thousand

were entering and leaving Peiping. The Chinese Army was in orderly retreat to the south. All fronts became quiet. Then suddenly the truce. By the close of May the organization at the hospital was disbanded, and thus terminated three active months of experience with war wounds.

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#### COMBINED MEDICAL AND SURGICAL TREATMENT OF GASTRIC DISORDERS

By LUCIUS W. JOHNSON, Captain, Medical Corps, United States Navy, and JAMES F. FINNEGAN, Lieutenant, Medical Corps, United States Navy

Countless pages of medical journals have been filled with discussions of medical versus surgical treatment of peptic ulcers and the proper time for medical treatment to be superseded by surgery. Study of the literature cannot fail to impress the reader with the fact that there is very little cooperation between the internist and the surgeon in most cases. Observation of a large number of patients and frequent consultations between our medical and surgical services have convinced us that the best results are secured when the internist and surgeon are in close association throughout the whole course of the case.

It is important for the surgeon to see numerous patients who are under medical treatment for peptic ulcer and observe their progress if he is to maintain the proper mental attitude toward ulcer treatment. For, if he sees only those in which surgery is done, he will come to believe that all medical treatment results in failure. It is equally important for the internist to observe the after-treatment of many operated ulcers for, if he sees only those in which symptoms persist after operation, he will come to believe that all surgical treatment is unsuccessful.

We believe that close association of internist and surgeon throughout the whole course of the case is best. Not only does the patient derive the greatest benefit from this sort of teamwork, but both internist and surgeon retain their proper sense of proportionate values and each acquires a healthy respect for the other one's ability and resources. It is well for each to see some of the successes of his colleague, not only his failures.

Neither surgeon nor internist believes that operation restores the stomach to the normal condition. Whether the operation be pyloroplasty, gastroenterostomy, gastrectomy, or something else, a highly artificial condition is produced to which the patient must learn to adapt himself. During the period of adaptation intelligent guidance is necessary. Patients display great individuality in their post-operative reactions, tolerances, and difficulties so that careful study and adjustment of the diet in this stage is essential. Therefore, we

believe that after the surgical period is completed, the patient should be returned to the care of the internist and dietitian for education in his changed relations to his alimentary tract.

To demonstrate this point, 12 patients were chosen. Each one had had a mechanically satisfactory gastroenterostomy performed at some other hospital; each had a functioning pylorus and none had experienced any relief from his symptoms after operation. By diagrams and other instruction they were shown the changes in the functioning of the stomach due to the operation. It was impressed on them that the digestive powers of the stomach were reduced and that they must chew their food more thoroughly than before. The salt content of the diet was kept very low and the carbohydrates high. Alkaline powders were given. They were informed that the ulcer was not cured even though the symptoms might subside and that it would be necessary to continue the diet and powders for at least a year and careful mastication always. Each change in the diet was supervised by the doctor and the dietitian and the effects carefully observed.

All of these patients promptly experienced relief of symptoms. They all gained in weight and left the hospital in excellent condition. Here are 12 cases that would have been judged as complete surgical failures had they not been salvaged by proper postoperative management. Brief notes on two of the cases will illustrate the general trend of the whole group.

*E. R. H., vet.*—Typical ulcer history since 1921. Hemorrhage in 1932. Perforation in 1932. Gastroenterostomy 6 weeks prior to admission with no relief of symptoms. He came to this hospital to see if anything could be done to help him. His symptoms were relieved in 3 days. His weight on admission was 109 pounds. When he left the hospital 23 days later it was 128 pounds and he was free of all symptoms.

*J. P. S., vet.*—Typical ulcer history for 15 years. Had gastroenterostomy nearly 11 years ago. He had many courses of Sippy diet with no relief of symptoms. One week after admission to our medical ward he was free from symptoms and he continued so until his discharge. He stated that he felt better than at any time during the last 15 years.

No special virtue is claimed for our particular method of ulcer treatment. The point we wish to make is that all these patients had been discharged from the hospital soon after operation without the necessary postoperative study and education. The surgery was satisfactory but the result was a failure because of this lack. Undoubtedly here is the source of a great deal of the opprobrium which is cast upon the surgical treatment of peptic ulcers.

In our routine treatment of ulcer cases the salt-free Lenhartz diet is used. Every half hour the patient receives 15 grains of an alkaline powder containing bismuth subnitrate, magnesium oxide, calcium tribasic phosphate, and magnesium tribasic phosphate. The details

of the treatment and the reasons for the use of this powder will be fully discussed in a paper now in preparation by one of us (J. F. F.).

Jejunostomy, as a palliative measure, has proved invaluable in cases of pyloric or gastric obstruction, usually due to carcinoma, when it was impossible to remove the growth. The usual outcome in such cases is death from starvation and thirst following a period of great suffering. After jejunostomy has been done and a tube inserted for feeding purposes, it is possible to maintain the nourishment of the body. It obviates the suffering from hunger, thirst, and vomiting. It prolongs life and keeps the patient happy and comfortable. The usual course after this operation is gradually increasing weakness with a relatively comfortable death from cancer of the liver. We have seen patients up and about in comfort for several months after a jejunostomy for inoperable cancer of the stomach.

We have followed this same plan in two cases of extensive indurated ulcer about the pylorus when the condition of the patients was such that we feared they would not survive a gastrectomy. A quick jejunostomy under local anesthesia was done, and feeding through the tube has made it possible to improve their condition so greatly that a direct operative attack on the ulcer will soon be feasible.

We use the simplest possible technique for jejunostomy, with only one suture in the bowel. The highest point in the jejunum that will come against the anterior abdominal wall without tension is selected. A —-shaped purse-string suture of 00 tanned gut on an atraumatic needle is inserted. A stab wound is made within the suture and a large-caliber self-retaining catheter is inserted. The suture is then tightened and tied. The other end of the catheter is pulled through a small slit in the omentum and may be brought out through the operative incision or, better, through a small stab wound. After the incision is closed, a firm pull on the catheter will bring omentum and intestine close together against the parietal peritoneum, insuring a tight closure. We usually wait 24 hours before introducing fluids through the tube.

Feedings are usually given every 2 hours. They may consist of milk, eggs, cocoa, beef juice, cod-liver oil, orange juice, or any other substances that will pass through the tube. In one case with marked inanition, the catheter was attached to a continuous-drip apparatus and the slow dropping continued night and day until he was able to tolerate larger amounts at short intervals.

When to operate for peptic ulcer; the exact time when medical treatment should be superseded by surgery, is always an important decision. In this hospital all patients with gastric disorders, except those in whom urgent surgery is required, go to the medical ward for study and treatment. They remain there as long as they con-

tinue to improve and experience relief of their symptoms. In many cases, of course, they go on to recovery without the question of surgery arising. If they cease to improve after a time or if their symptoms are not relieved, then surgical consultation is sought. Failure to yield to medical treatment appears to us to be one of the principal indications for surgery. Most of the cases which fall into this class have a considerable degree of gastric retention.

If operation is recommended and the patient does not want it, it is usually better not to urge him too strongly. Experience shows that the result of the operation is profoundly affected by the patient's mental attitude and surgery should be postponed until he is ready to accept it without question. Gaining the patient's confidence and selling the operation to him are essential. If the operation is done under any degree of compulsion, while the patient is still in an argumentative frame of mind, it is likely that the postoperative course will be stormy and the ultimate result poor. Several times we have sent doubting patients to the surgical ward to talk with those who had been operated on and this has seldom failed to correct their point of view.

The duodenal tube is a valuable adjunct to treatment of peptic ulcer. Painful ulcers may be successfully treated by giving all food through the tube, thus maintaining the nutrition while the stomach is placed at rest for prolonged periods. We have kept the tube in place for as long as 2 months, but usually it is removed every 2 or 3 weeks to inspect the tube and check the progress of healing by fluoroscopy. Some men use the retained duodenal tube routinely in all their ulcer cases and rapid healing is the frequent result. The patients soon become accustomed to the presence of the tube in the nose or mouth and seldom complain of it after the first few days. We have used this method after operation for ruptured ulcer in which simple closure of the ulcer was done and have been pleased with the rapid healing and freedom from symptoms. In gastrectomy or gastroenterostomy the tube may be inserted before operation and the tip passed through the anastomosis when that stage of the operation is completed. Thus early feeding with a minimum of gastric peristalsis is made possible.

We have had eight cases of acute perforated gastric ulcer. One developed in the medical ward while under treatment. Another was brought by airplane from a ship over a hundred miles at sea. All were operated and recovered. We make no effort to do more than close the perforation at the time of the emergency operation. When the perforation was small and there was no gross contamination of the peritoneum with food particles, we have omitted drainage and closed the abdomen tightly. This has proved to be a safe and satisfactory method.

Transfusion is frequently employed, both as a part of the preoperative preparation in asthenic patients and during the operation. It forestalls postoperative shock and promotes smooth recovery.

Many patients were admitted complaining of persistence of symptoms after gastroenterostomy and were carefully studied to determine the cause of failure. The more common causes were: (1) Failure to instruct the patient in his dietary limitations; (2) improper selection of cases for operation; (3) gastrojejunal ulcer; (4) poorly functioning stoma. Twelve patients who came under the first classification were discharged free of symptoms after education in proper diet and habits of eating. Three cases under the second heading, recently operated elsewhere, showed no evidence of any ulcer that would have justified the operation. They were relieved by dietary education. Two patients with gastrojejunal ulcer were operated, the ulcer excised and the stoma closed. Poorly functioning anastomoses were due to the opening being too small and placed too high so that they did not drain the stomach. Two patients were seen with supposed persistence of symptoms after gastroenterostomy but X-ray and operative examinations failed to show any anastomosis.

What shall we do in the presence of severe hemorrhage, presumably from the stomach? That is always an interesting problem, beset with pitfalls, which has caused us many an anxious moment.

There is a strong tendency on the part of the internist to demand immediate surgery in the presence of massive or persistent hemorrhage. The surgeon should not permit himself to be hurried into an ill-advised operation without careful consideration of the many aspects of the case.

First, is the bleeding surely from the stomach and not from esophageal varices or some pulmonary condition? If the patient is seen in an emergency, without previous history, it may be difficult to establish this point. It should be established before operation is done.

Second, will the patient survive the operation? Almost any of the procedures that we may adopt to stop gastric hemorrhage will be radical and extensive enough to tax the resistance of a patient in the best of condition. One who has just experienced a severe hemorrhage is far from being an ideal subject, even after transfusion. Some experienced surgeons say that the patient is more likely to die from the operation than from the hemorrhage.

Third, is operative interference necessary? It can be accepted as an axiom that death from the first hemorrhage in ulcer cases is extremely rare. On the other hand, repeated hemorrhages are generally accepted as an indication for operation, after the patient is brought to the best possible condition by transfusions and other means.



We have seen three cases which illustrate some of the difficulties in making a decision.

1. An officer, aged 37, with no previous symptoms of illness, suddenly vomited a large quantity of bright red blood. He started for the sick-bay, vomiting a stomach-full of blood at every few steps and fell dead across the threshold. At autopsy a most careful search was made of all the organs from which the blood might have come but no lesion could be found as the source of the bleeding.

2. A man, aged 56, had several hemorrhages from a gastric ulcer. He finally came to operation and we removed a large, indurated ulcer from the posterior wall by a V-shaped resection. Twelve hours later he commenced vomiting bright red blood. Two transfusions were given and, 36 hours after the first operation, he was reoperated. The stomach was full of blood but the suture lines appeared perfect and no lesion could be found to account for the bleeding. At autopsy a detailed search was made but no source of the hemorrhage could be found.

3. A middle-aged man was admitted with a history of vomiting blood for 24 hours. He died shortly after admission. At autopsy the whole gastric mucosa was found to be studded with hundreds of small ulcers, any or all of which might have been the source of the bleeding.

Operation in cases such as these is futile. But we have had other cases in which an actively bleeding vessel was easily found and secured, thus putting an end to the bleeding. Several patients on whom we did not operate recovered. Some of them were later found to have peptic ulcers. In others the source of the hemorrhage was never determined.

Two recent articles on this subject by writers of equal authority give opposite advice. One states that all cases of probable gastric hemorrhage should be operated at once. The other advises the exact contrary. Our belief is that either one of these rules, if rigidly followed, will show about the same number of failures as the other. One should avoid bias and approach each case with an open mind. Two safe rules can be given. Death from the first hemorrhage is rare. Repeated hemorrhages demand surgery.

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#### THE USE OF PLASMOCHIN IN MALARIA TO PREVENT RELAPSE

By REYNOLDS HAYDEN, Captain, Medical Corps, United States Navy

At the Marine Barracks, Quantico, Va., there is a constant influx of Marines returning from duty in the tropics. Many of these had acute malaria in the tropics and many developed acute relapses after arrival at Quantico.

While on duty as post surgeon at Quantico, the writer was very anxious to prevent recurrences of acute malaria among troops recently returned from the tropics, not only for the sake of the men themselves, but to prevent any infection of malaria-bearing mosqui-

toes about Quantico. Though such mosquitoes were present at Quantico, no original cases of malaria had developed there for several years. While the number of cases herein described is not great, it is of considerable interest as indicating the great advantage of the plasmochin follow-up treatment in preventing malarial relapses.

During a period of 8 months, 125 men with histories of recent acute malaria were given follow-up treatment. Of these, 72 were given quinine alone, 10 grains daily except Sunday for a period of 8 weeks. Of these, 17 men, 23.6 percent, had acute recurrence of their malaria either toward the end of their period of follow-up treatment or shortly after its completion. The remaining 53 men were given follow-up treatment of quinine and plasmochin. This treatment consisted of 10 grains of quinine daily for 3 weeks and 2 centigrams (gr.  $\frac{1}{3}$ ) of plasmochin daily for 6 consecutive days each week for the first and second week of this treatment. Of these 53 cases only 3 had relapses, 5.6 percent.

Clinical details of these cases are omitted here as being nonessential. The malarial infections were of various types—tertian, quartan, malignant tertian, and mixed. These results obtained at Quantico correspond to results reported by the United Fruit Co. from their experience in Central America.

Every precaution was taken at Quantico to insure the men actually receiving the follow-up treatment prescribed. Lists were carefully checked to see that all men reported for treatment. The medicine was always taken at the dispensary and in the presence of a hospital corpsman.

In view of his experience in this respect at Quantico and of reports from other places on the same subject, the writer is of the opinion that plasmochin should be regarded as an essential part of post-malarial follow-up treatment and should be administered in combination with quinine. The writer is further of the opinion that plasmochin should be included in the medical supplies of all expeditionary troops doing duty in the tropics.

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#### THE FRIEDMAN HORMONE TEST FOR PREGNANCY

By W. W. HALL, Lieutenant Commander, Medical Corps, United States Navy, and  
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Laboratory tests for pregnancy as distinguished from physiologic changes and physical signs indicative of pregnancy seem a rather recent development to most of us. Aschheim and Zondek (1), however, establish the antiquity of such tests by quoting an Egyptian papyrus over 3,000 years old which reads: "A woman may determine if she is pregnant by taking some earth and barley in a vessel and

adding to it a little of her urine day by day. Should the barley grow, the woman is pregnant, but if the grain does not grow then she will not bear a child."

The need of a reliable test for pregnancy is obvious. What can cause greater concern or be of greater embarrassment to the doctor than the diagnosis of pregnancy? Differentiation of pregnancy from the amenorrheas, of lactation, of the menopause, of endocrine origin, or those secondary to more remote pathological conditions and processes, presents many a vexatious problem. The most expert examiner with the finest facilities is often forced to make simply a good guess or to advise the patient to await developments. A prompt accurate diagnosis backed by the report of a highly accurate reaction clears the atmosphere, pleases the patient, and enhances the prestige of the doctor. The importance of the differential diagnosis of ectopic pregnancy, ovarian and uterine tumors, hydatidiform mole, and the urgency for an early positive diagnosis need not be emphasized.

The purpose of this paper is to discuss and report upon the Friedman modification of the Aschheim-Zondek test for pregnancy. The groundwork for this reaction was laid when Zondek and Aschheim in 1925 demonstrated the presence of a substance in the urine of pregnant women, which, upon injection into immature female white mice, caused ovulation in about one hundred hours. Zondek believed that this substance contained in the urine of pregnant women was the hormone of the anterior lobe of the hypophysis. Smith (2) proved that the anterior lobe hormone is a nonspecific sexual activating hormone bringing about precocious maturity in either male or female young animals. That this hormone found in pregnant urine actually arises in the anterior pituitary has been doubted by some. Ware and Main (3) have recently stated that the hormone arises in the placenta, enters the blood, and is excreted in the urine. That the placenta has an essential part to play is undoubted. The proper explanation appears to be that the embryonal tissue produces a hormone or substance which stimulates the anterior pituitary to the tremendous overproduction of a hormone, the excess being excreted in the urine. Work is now under way which indicates conclusively that this substance in the urine of pregnant women is indeed the product of the pituitary. Ball (4), by an ingenious operation, removes the entire hypophysis of albino rats, leaving them otherwise normal. The cycle of estrus, however, stops completely with atrophy of the uterus. Injection of Follutein (Squibb), a product produced by concentration of the hormone from the urine of pregnant women, reestablishes normal estrus in the female hypophysectomized rat and a return to normal of the atrophied seminal vesicles and prostate in the male rat.

McNeile and Reynolds summarize the important known facts with reference to the ovarian and pituitary hormones as follows:

1. The hormone of the anterior lobe of the pituitary acts as the activating substance producing ovulation in the ovary.
2. The anterior lobe hormone reaches a high level in the blood, and is excreted in demonstrable quantities in the urine a few days following conception, the exact time as yet not having been determined.
3. The anterior lobe hormone is never excreted in the urine in demonstrable quantities in conditions other than pregnancy, hydatid mole, and chorio-epithelioma.
4. The ovarian hormone, not the pituitary, prepares the uterus for pregnancy, i.e., produces hypertrophy and vascularization.
5. The ovarian hormone is excreted in the urine at a later period following conception, probably 6 to 8 weeks.
6. It is present in the urine in demonstrable quantities in many other conditions, these conditions in several instances being the most important ones in which differential diagnosis of pregnancy occurs.

The blood of the pregnant woman shows a marked increase of both the pituitary and ovarian hormone. With the onset of pregnancy the rise of the ovarian hormone is gradual over a period of weeks. In contrast, the pituitary hormone rises rather acutely, a high level being reached a few days after conception. This remains high until the eighth month of pregnancy after which it gradually drops, reaching a normal level about the eighth day after delivery. This abrupt increase of the pituitary hormone, coupled with the fact that it reaches demonstrable amounts in the urine only in the presence of pregnancy, with two exceptions—hydatid mole and chorio-epithelioma—makes it the ideal hormone the determination of which makes possible an early and accurate diagnosis of pregnancy.

The test devised by Aschheim and Zondek (5) was a means of determining the presence of the anterior pituitary lobe hormone in the urine of pregnant women. The urine was injected into immature female white mice in varying quantities, and after 100 hours the ovaries of the mouse were examined for corpora hemorrhagica. Five or six female mice 21 days old were required for each test. This necessitated the maintenance of a colony running into the thousands in order that females of the proper age might always be available.

The Aschheim-Zondek test, commonly called "the A-Z test" has been used the world over, an accuracy of up to 98 or 99 percent being reported where the test was carefully run. Accurate as is the A-Z test, it is obviously so cumbersome that its use in other than large clinics is almost impossible.

When Friedman in 1929 reported on the mechanism of ovulation in the rabbit (7) and on ovulation produced by the injection of urine from pregnant women it was recognized that the rabbit was the ideal test animal for use in hormone reactions for pregnancy. The fact that makes the rabbit an ideal animal for use in such tests is that, although ova continually mature and graafian follicles ripen in the ovaries of the rabbit, ovulation does not take place until after copulation. Thus in properly caged female rabbits it is

possible to study the effect of urine on ovaries previously free of corpora hemorrhagica. Another fact that makes the rabbit the ideal animal is that after reaching maturity it is always ready for use in the test. One only need be assured that the rabbit has not recently copulated, is not pregnant, or has not been used as a test animal in the previous 6 weeks or 2 months.

The technic of the Friedman hormone test for pregnancy, quoted from Friedman and Lapham's article (8) is as follows:

The materials and equipment necessary for the performance of the proposed test are: (a) An ordinary bedpan specimen of urine, (b) a 5-cubic-centimeter syringe, and (c) an unmated mature female rabbit. The urine is injected intravenously thrice daily for 2 days in 4-cubic-centimeter doses. Forty-eight hours after the first injection the rabbit is killed. If the ovaries contain either corpora lutea or large bulging corpora hemorrhagica, the reaction is positive and the patient who furnished the sample is presumably pregnant. If the ovaries contain neither corpora lutea nor corpora hemorrhagica but only clear unruptured follicles, regardless of their size, the reaction is negative.

The original technic of Friedman's test has been modified in a number of ways by various workers. The variations have been principally in the dosage of urine, i.e., the size and number of injections, the time of observation of the result, and the method of making the observation.

The technic which we have used follows: The urine specimens used are preferably the first voided on rising. Ten to twelve cubic centimeters of this urine are injected intravenously on two successive mornings. The ovaries of the rabbit are examined by laparotomy 24 hours after the second injection.

The animals selected are healthy mature female rabbits more than 4 months old. On the average, female rabbits attain sexual maturity in 5 months. If the animal is purchased from an outside source it is caged separately for 2 weeks before use. As the period of gestation in the rabbit is but 21 days, a pregnant animal will be easily detected by palpation and eliminated at the end of 2 weeks, or if ovulation without conception has resulted from excitation by a buck, the corpora hemorrhagica will have entirely disappeared by this time.

The urine specimens preferred are the first voided on rising, because the hormone as well as other constituents will be more concentrated in the high-specific-gravity urine voided at this time. A specimen voided in a clean vessel is satisfactory. Sterility is not necessary. We request that the specimens be not more than 4 hours old to avoid possible deterioration of the hormone. Evidence is accumulating, however, which indicates that the hormone is not as labile as at first thought. McGath and Randall (9) recommend that the urine be injected within an hour of voiding. Friedman

(8) believes that if the specimen be kept on ice the hormone will not lose strength materially in 6 days. Wilson and Corner (10) find that if stored on ice the hormone in active specimens remains potent for months. McNeile and Reynolds (6) report experience which indicates that specimens sent through the mails suffer little loss of potency.

The size of the injection and the number of injections have been points of controversy. White and Severance (11) used a single dose. Friedman (7) in commenting on the 10 percent error in their series said:

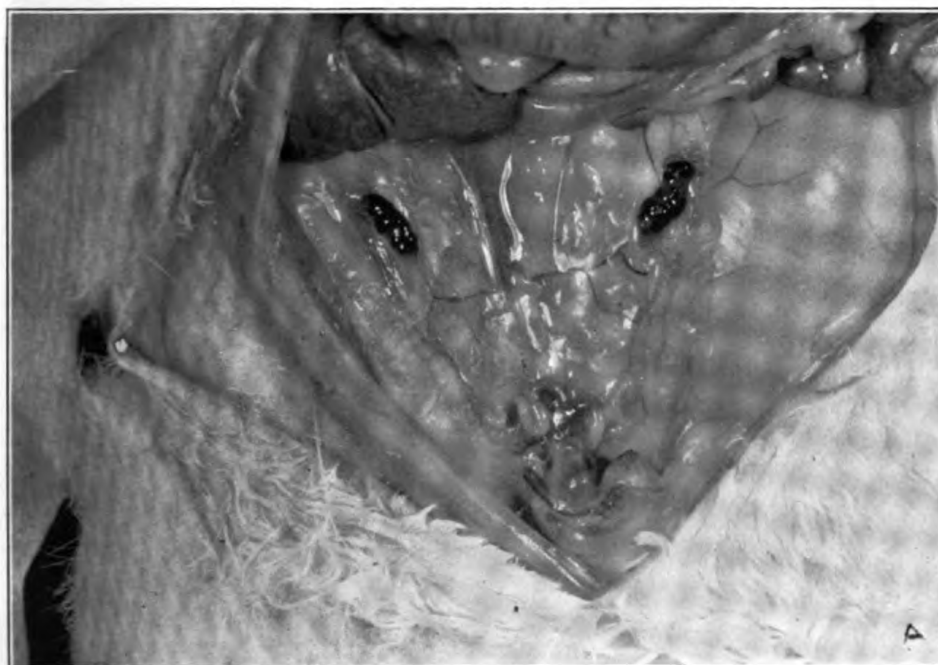
I think in an effort to simplify this test one may simplify it into oblivion by making the procedure altogether too simple. I would urge that unless one knows absolutely the kind of stock dealt with, one should use more than one injection \* \* \*

If one titrates the amount of effective substance in the urine, he will find that in a 7 months pregnancy as little as  $\frac{1}{8}$  cc of urine injected into a suitable rabbit will give a positive response. If, however, one uses an adult animal, but an animal that is not in heat, that quantity will not do it. One may inject many times that quantity and it will not do it. In order to get an effective response of the urine of pregnancy with a minimal quantity, one must use a rabbit that is known to be in heat. One cannot tell from external inspection whether or not the rabbit is in heat.

As noted above, Friedman injected the urine thrice daily for 2 days in 4 cubic centimeter doses and killed his rabbits 48 hours after the first dose.

The time interval between injection and examination has also been varied by different investigators. Their experience indicates that the 48-hour period is the safest. Wilson and Corner (10) in using a 20-hour period with success always employed mature rabbits, thus eliminating the time necessary to bring the immature ovary to maturity. Schneider (12) suggests that, in cases where time is a factor, two animals be injected. One is then killed in 12 to 16 hours and if positive the other need not be sacrificed. If one uses the laparotomy method as we have, the animal may be closed following the first early examination and opened again later after another injection for a final reading. Reinhart and Scott (13) used this explanatory laparotomy method with success. We have found little difficulty with laparotomies. The rabbit is remarkably resistant to infection. Absolute sterility is not necessary. Fatal peritonitis has only resulted once in nearly 200 laparotomies. We have utilized animals as many as 5 or 6 times with a rest period of 6 weeks between each test.

The reading of the test presents no great difficulty. In the negative the ovary is white or light pink and is usually studded with clear mature graafian follicles. The uterus is also usually not injected. Congestion and injection of the uterus, however, is



**RABBIT SHOWING POSITIVE FRIEDMAN HORMONE TEST FOR PREGNANCY.**  
Note the dark corpora hemorrhagica filling both ovaries.





thought to be produced by the ovarian hormone independent of the anterior pituitary and thus has no significance in the reading of the test. The positive reactions present an ovary studded with from 1 or 2 to half a dozen or more corpora hemorrhagica (see illustration) and a coiled hyperemic uterus. McNeile and Reynolds (6) call attention to the small rosy spots that may appear in large clear follicles which are perhaps suggestive but not positive and should be retested. There has been no confusion in our work through the repeated use of mature rabbits. In fact, we prefer the mature to the immature rabbit.

Positive reactions occur in cases in which embryonal tissue is in biological contact with maternal or host tissue. Conditions other than pregnancy in which positive reactions occur are hydatidiform mole, chorio-epithelioma, and certain embryonal malignant tumors of the testis. Tubal pregnancy in which the fetus is dead but the placental tissue still viable, and incomplete abortion with retention of viable placental tissue also give positive reactions. Positive reactions not occasioned by one of the above conditions, termed "false positives" should be exceedingly rare and probably accounted for by improper protection of the test animal from contact with the male or by confusion of specimens.

False negative reactions occur with pregnancies in which all placental tissue is dead, missed abortions, and ectopic pregnancies (6). They may be occasioned by the use of an immature animal which is incapable of reacting or by accidental confusion or willful substitution of specimens by persons interested in inducing the doctor to curette the uterus in the patient being studied.

*Summary of tests conducted*

Positive reactions.....	80	False positives.....	0
Negative reactions.....	84	False negatives.....	2
	—	False negatives.....	2
Total.....	164		

False negative reactions were obtained in two cases, one 5 weeks, the other 6 weeks past their last regular menstrual period. One month later, when clinical signs still suggested pregnancy, tests were repeated and positives obtained in each case. Specimens in these two false negative reactions were not catheterized but were voided and delivered at the laboratory by the patient or her messenger.

Of the positive reactions there were 79 pregnancies, 1 seminoma testis. Of the pregnancies, 67 were checked completely, that is, either followed to delivery, the diagnosis verified by undoubted clinical signs, or the material passed in abortion examined for placental villi. Twelve left our care before clinical check was completed, some we know to visit an abortionist.

Our negative reactions were distributed as follows: Fibroids 17, pituitary tumor 1, seminoma testis (post-operative) 6, hydatid mole (post-operative) 1, amenorrhea (various causes) 57, early pregnancy (false negative) 2. Error in series 1.29 percent.

The volume of obstetrical work done by the outpatient department of the Naval Hospital, San Diego, has afforded us the opportunity to study the application of the Friedman modification of the Aschheim-Zondek test for pregnancy, and we have found it of great value, both in its positive and negative phases. It has been the means of arriving at an early solution of obscure and baffling conditions, thereby enabling us to institute appropriate therapeutic measures earlier than otherwise would have been possible.

The cases reported in this paper have been followed for such a period of time as to allow us to check definitely the accuracy of the reaction obtained in the laboratory.

The accuracy of the Aschheim-Zondek test has been satisfactorily demonstrated by workers throughout the country, and it has been definitely proved that the percentage of error is very small,  $1\frac{1}{2}$  to 2 percent. H. M. Evans and M. E. Simpson (14) cite 24 groups of workers and over 3,000 cases in which the percentage of error rarely exceeded 2 percent. H. Allen and F. Dickens (15) report 208 cases in which only 1 specimen gave an incorrect result.

To enumerate some conditions where a negative reaction is of value as a diagnostic aid we mention:

1. Cases of false or imagined pregnancy.
2. In differentiating between pregnancy and fibroids.
3. Cases of criminal assault.
4. As an aid in studying amenorrhea.

Conditions in which a positive reaction is an aid in diagnosis:

1. Early normal pregnancy.
2. Cases suffering from chronic infections where pregnancy has taken place.
3. Illegitimate pregnancies.
4. Tubal pregnancies.
5. Hydatid mole and chorionepithelioma.
6. Embryonal malignant tumors of the testis.

Cases of false or imagined pregnancy: It is not uncommon to encounter a young married woman who is very desirous of becoming pregnant and who after a few years, being well informed of all the subjective symptoms, decides she is pregnant and so states to her doctor. In spite of negative physical and palpatory findings and statements from her doctor she remains firm in her belief. A negative hormone reaction usually convinces her of her error as this type of patient is prone to accept a laboratory finding. Case 33 of our series is a case of this type. This patient presented all the symptoms of pregnancy, even claiming that she had felt life.

Physical findings were negative. The Friedman reaction was negative. She was found to have an infantile type uterus.

In differentiating between pregnancy and fibroids: The value of a negative reaction in differentiating between pregnancy and tumors of the uterus can readily be appreciated. Cases 1, 14, and 42 were all diagnosed clinically as probable fibroid. The hormone reaction in each case was negative and the diagnosis of fibroids verified at operation.

Some difficulty may be experienced in arriving at a definite diagnosis when a pregnancy is implanted upon a fibrotic condition with a resulting positive Friedman reaction. This is especially true if the tumor has undergone cystic degeneration. But the subsequent events, abortion, or operative procedures, will prove the correctness of the hormone reaction. Case 52 in our series exemplifies this. This patient was diagnosed tumor of the uterus and a laparotomy performed. On inspection the uterus presented the appearance, color, consistency, etc., of a pregnant uterus. The abdomen was closed and a Friedman test done postoperative. The test was strongly positive. Ten days later the patient began to have abdominal cramps and utrine bleeding with several large clots being passed. Unfortunately the specimens were destroyed. It was considered that a spontaneous abortion had taken place. The patient was seen at frequent intervals and it was found that the uterus was still large. A second Friedman test was done which proved negative. Patient was again operated on, the uterus removed, which showed a cystic myoma impinging on the uterine canal.

Cases of criminal assault: In cases of criminal assault the early knowledge as to whether or not pregnancy has taken place is highly important, and may prove invaluable from a medico-legal standpoint. In cases of this kind the emotional shock, fear, and horror of a possible resulting pregnancy may produce an amenorrhea. A negative hormone reaction in such cases will allow the physician to assure the patient that no pregnancy exists, thereby removing the long wait and its accompanying anxieties before a negative diagnosis can be made from physical examination. This aids in restoring the patient's emotional equilibrium. In cases of criminal assault that give a positive reaction to the Friedman test, the physician is enabled to map out his therapeutic campaign in such a manner as the circumstances of the case or the condition of the patient may warrant. Two cases of this kind are among our series. In each case assault was positively known to have taken place. One case, that of an unmarried girl, age 15, gave a positive reaction; the other case, a married woman, age 28, gave a negative reaction. The tests were proven to be correct in each instance.

The study of amenorrhea: In making a study of amenorrhea it is very important to be able definitely to rule out pregnancy. The hormone test for pregnancy becomes of value in these conditions. With a negative reaction we can look for other causes, and feel assured that the existing amenorrhea is not a result of pregnancy.

Early normal pregnancy: As previously stated, the early diagnosis of pregnancy is of primary importance in the application of the hormone test and it was for the purpose of diagnosing early normal pregnancy that the majority of our cases were tested. Hence we list normal pregnancy first among the list of conditions where a positive test is of value. Our series shows 80 cases so tested. These were cases that presented only history and the presumptive signs of pregnancy as an aid to the diagnosis. Positive physical findings in the majority of the cases had not become manifest. Of this number 67 were either followed clinically until date of delivery or for such time as to make certain of the accuracy of the test. Twelve were transferred or left our care. In some cases it was known that they visited an abortionist. Aschheim (5) says the test has been found positive as early as 3 to 5 days after the date of expected menstruation. Our earliest positive test was 10 days after the date of expected menstruation.

Cases of patients suffering from chronic infections: In patients known to be suffering from tuberculosis or cardiac disease, and who become pregnant, the early definite knowledge that a pregnancy exists affords the physician in charge of the case the opportunity to fortify his patient against the wear and tear of the ensuing 9 months and subsequent labor.

Illegitimate pregnancies: Although we may accept the often quoted saying that "respectability is no barrier to the spermatozoa", we may find ourselves confronted with the problem of determining whether or not an unmarried girl or woman is pregnant. In dealing with cases where pregnancy is suspected in unmarried individuals, we must bear in mind that they are seized with a fear for the safety of their moral and social standing, a fear that gives vent to lying, subterfuge, and trickery, in the forlorn hope that the doctor may be led diagnostically astray and "do something." The physician's professional reputation is also subject to criticism should he err in the diagnosis of these cases. In facing the unmarried pregnant girl, who has steadfastly denied any sex relations, we know of no test that gives the physician the same degree of comfort in, and assurance of, being correct in his diagnosis, as does a positive hormone test for pregnancy. It is the physician's sheet anchor, and, armed with it, is equivalent to his having the written confession of the patient that she has been guilty of indiscretions of a sexual nature.

**Tubal pregnancy:** It is often impossible to distinguish an early, threatened, uterine abortion, a mild salpingitis, or a corpus luteum cyst from a tubal pregnancy on history and physical findings alone. If we accept the statement of Aschheim that the Aschheim-Zondek test remains positive as long as there is living placental tissue in biologic contact with the maternal blood, the test gives us a valuable aid in arriving at the diagnosis of tubal pregnancy. Aschheim also states that the test may be positive 8 to 10 days after the embryonic death and that it has been found positive on the ninth and twelfth day after abortion. But as he states, it is cases with living embryo that the diagnosis is important. After the death of the embryo the worst danger is past. Three of our series of cases represent tubal pregnancies. Two of these were diagnosed with the aid of the Friedman test and operation proved the correctness of the diagnosis. The third was diagnosed incomplete abortion, diagnosis was made largely on history as no palpatory findings were positive. No test was done at this time. Due to continued uterine bleeding the uterus was cleaned out. The scrapings were negative for placental tissue. The bleeding ceased and the patient went home. Three weeks later patient returned complaining of uterine bleeding and some pain in the right side. Palpation revealed a mass in the right lower quadrant. Friedman test was positive. The diagnosis of tubal pregnancy was made and verified at operation.

Case 24 argues well for the value of a positive Friedman test as a diagnostic aid in pregnancy and presents some unusual features. The patient, a young woman, age 22, married 5 months, complained of being unable to have sexual intercourse. From the history obtained vaginismus was suspected. An attempted pelvic examination proved this to be the case, as any attempt to examine the genitalia produced a violent spasm of the musculature of the lower extremities. The history also elicited the fact that there had been no menses for 6 weeks, but the patient had not entertained the idea of a possible pregnancy on account of the inability to have intercourse but admitted several attempts. The Friedman test proved to be positive. Under gas anesthesia examination revealed the hymen to be intact. It was of normal thickness, resistance, etc., and ruptured easily on digital manipulation. The vagina was normal. No abnormalities were noted. The uterus was enlarged to about the size of a 10 weeks pregnancy. This patient delivered a full term child 7½ months later.

Hydatid mole and chorionepithelioma have been shown to give strongly positive reaction to the hormone test, thus giving us a means of diagnosing these cases and determining the cure or recurrences after treatment. Case 23 was a case of hydatid mole which

had been removed 12 months prior. The Friedman reaction was negative and the patient symptom free.

Embryonal malignant tumors of the testis have been reported as giving a strongly positive reaction. Case 43 of our series was a case of seminoma of the testis, reported by Johnson and Hall (16). Our series also shows 3 post-operative cases of seminoma, all of which gave a negative hormone reaction in which the test was run after the microscopic diagnosis was made. Negative reactions in these cases indicated absence of metastases. Clinical checkup of nearly 2 years substantiates this conclusion.

To avoid possible errors, such as mislabeling of specimens or substitution of urine, it is advisable to collect the specimens of urine by means of a catheter and fill out the request slip (we use a special form for this) and have the specimen delivered directly to the laboratory. It is best to explain the nature of the test to the patient. It should be performed with her consent and knowledge and the results communicated directly to her, where possible.

#### SUMMARY

The Friedman hormone test for pregnancy is a convenient and highly accurate test. Ninety-eight to one hundred percent accuracy has been reported by workers in many thousands of tests. The test depends upon the great overproduction of anterior pituitary sex hormone and the excretion of this hormone in the urine. Viable embryonal tissue in biological contact with the host stimulates the anterior pituitary to activity. Urine containing adequate amounts of the pituitary sex hormone, when injected into suitable animals, causes ovulation and the production of corpora hemorrhagica in the ovary. The rabbit, the animal utilized in the Friedman test, is an ideal test animal, as the mature female continually matures graafian follicles but does not ovulate except following copulation or in response to stimulation by injected hormone.

The technic we have followed utilizes two intravenous injections of 12 centimeters each, 24 hours apart. Injection is made in the marginal ear vein of the rabbit. The rabbit may be opened by laparotomy in 24 hours if time is a factor. If positive, the animal is closed and not further injected. If negative, the second injection is given and the final reading made 24 hours following, that is, 48 hours following the first injection of urine. Our routine has been to perform laparotomies at the end of 48 hours. Animals have been used repeatedly with a 6-weeks' interval between tests. Our series totals 164 cases, with 2 false negative reactions, an error of 1.29 percent.

## BIBLIOGRAPHY

1. Aschheim, S., and Zondek, B.: Die Schwangerschaftsdiagnose aus dem Harn durch Nachweis des Hypophysenvorderlappenhormons. *Klinische Wochenschrift*. 7:1453-1457 (July 29), 1928.
2. Smith, P. E.: Induction of Precocious Sexual Maturity by Pituitary Homeotransplants. *Amer. Jour., Physiol.*, 8:114-125, 1927.
3. Ware, H. H., and Main, R. J.: Observations on the Accuracy of the Rabbit Ovulation Test for Pregnancy. *Jour. Lab. & Clin. Med.* 18:3, 254 (Dec.), 1932.
4. Dr. H. A. Ball, pathologist, San Diego County Hospital, San Diego, Calif.: Personal communication.
5. Aschheim, Selmar.: The Early Diagnosis of Pregnancy, Chorionepithelioma and Hydatidiform Mole by the Aschheim-Zondek Test. *Amer. Jour. Obst. & Gynec.* 19:335-342 (Mar.), 1930.
6. McNeill, Lyle G., and Reynolds, P. A.: The Friedman Test for Pregnancy. *California and Western Medicine* 38:1. Jan. 1933.
7. Friedman, M. H.: Mechanism of Ovulation in the Rabbit: II Ovulation Produced by the Injection of Urine from Pregnant Women. *Am. Jour. Physiol.* 90:617-622 (Nov. 1929).
8. Friedman, Maurice H., and Lapham, Maxwell E.: A Simple Rapid Procedure for the Laboratory Diagnosis of Early Pregnancies. *Amer. Jour. Obst. & Gynec.* 21:405 (Mar.), 1931.
9. McGath, Thomas B., and Randall, Lawrence M.: Friedman's Hormone Test for Pregnancy, *J.A.M.A.*, 96:1933-1934 (June 6), 1931.
10. Wilson, Karl M., and Corner, George W.: The Results of the Rabbit Ovulation Test in the Diagnosis of Pregnancy. *Amer. J. Obst. and Gynec.*, 22:513-519 (Oct.), 1931.
11. White, Milo R., and Severance, Alvin O.: Comparison of Pregnancy Tests. *J.A.M.A.*, 97:1275-1279 (Oct. 31), 1931.
12. Schneider, P. F.: A Hormone Test for the Diagnosis of Early Pregnancy, *Surg. Gynec. and Obst.*, 52:56-60 (Jan.), 1931.
13. Reinhart, Harry L., and Scott, Ernest: A modification of the Aschheim-Zondek Test for Pregnancy, *J.A.M.A.*, 96:1565-1567 (May 9), 1931.
14. Evans, H. M., and Simpson, M. E.: Aschheim-Zondek Test for Pregnancy, Its Present Status. *California and Western Medicine*, 32:3, 144 (Mar.), 1930.
15. Allen, H., and Dickens, F.: The Zondek and Aschheim Test for Pregnancy. *The Lancet*, 218:1, 39 (Jan. 4), 1930.
16. Johnson, L. W., and Hall, W. W.: Malignant Tumor of Testicle with Positive Aschheim-Zondek Reaction. *U.S. Naval Medical Bulletin*, 30:4, 516 (Oct.), 1932.

## FRACTURES OF THE MANDIBLE

By C. H. MACK, Commander, Dental Corps, United States Navy, and J. H. CONNELLY, (Jr. Gr.), Dental Corps, United States Navy

A study of the results of a group of 50 consecutive fractures of the mandible, covering our work in this particular phase of oral surgery at the New York Naval Hospital, for 10 months, presents some rather interesting conclusions.

Probably the first point of interest is the etiology of these fractures. While the stories which we get from patients on admittance are many and varied, we manage sometime during the treatment, to get the

real facts and I think we are safe in assuming that at least 75 percent in our series are caused by blows from the fist.

The fracture occurring most frequently is the single fracture through the angle region, compounded into the mouth, either by a tear in the tissue, or by involvement of the roots of the lower third molar tooth. Of this group of 50 cases, 26 were fractures through this region, about half of them involving the lower third molar, so that the removal of the tooth was indicated.

It is advisable to remove involved posterior teeth in most cases. In the interior part of the mouth they can frequently be retained with safety; however, in the molar and bicuspid regions removal of the involved tooth or teeth before wiring will save time by prevention of later osteomyelitis or abscess formation in the fracture line. It is advisable to wait 2 or 3 days after the removal of the involved tooth, to allow the trauma following the extraction to subside, before placing the wires.

The system of fixation which we use in most cases of this type, where the patient has a fair complement of teeth, is the "eyelet method." An eyelet formed in the end of a double strand of 24-gage brass wire, passed between the bicuspid teeth, brought around the neck of the tooth on either side, through the eyelet in front and tightened up. Doing the same on the corresponding teeth in the opposing arch and getting our intermaxillary fixation by means of a separate wire passed through the eyelets above and below. In the anterior part of the mouth we think it advisable to include both central and lateral in our loop, rather than just one tooth, as the tendency here is to loosen these teeth, particularly if there is some alveolar atrophy, which is often the case in the lower anterior region.

In hospital work, where the dental officer is called upon to do considerable routine dental work as well as oral surgery, time is necessarily a big factor and the ease and speed with which this type of fixation can be applied makes it the method of choice. Then again, with this type of wiring, the occlusion can be checked at all times. If the patient is seen for a few minutes daily, any slight adjustments necessary can be made, insuring a normal occlusion at the termination of the case. In our dental examinations of Veterans' Bureau patients we occasionally run across cases of old fractures where the fracture was treated disregarding the restoration of the normal occlusion, and invariably in these cases a traumatic alveolar atrophy has developed, due to the resulting malocclusion, which will result in early loss of the teeth.

We notice a tendency in some of these cases of fracture through the angle, for the short posterior fragment to be pulled up by the elevator muscles, causing a slight upward malalignment in the com-



pleted case. However, this is of minor importance. Providing the normal occlusion has been restored, and a good union has resulted, the slight upward deviation of the short posterior fragment will not be enough to cause any difference in the external contour of the patient's face at this location.

This same method was used on other fractures in the bicuspid and molar region, of which we had 8 out of this group of 50, except in cases where the mouth was lacking in the necessary teeth for retention and it was necessary to devise other means of fixation.

Another common fracture in this group was the fracture through the region of the symphysis, 6 of this group being in this area. In the ordinary simple fracture in this region, most any type of fixation would give a very satisfactory result. However, it not infrequently happens that there is considerable comminution of the bone along the fracture line, with some of the lower anterior teeth knocked out by the impact of the blow. Should some loss of bone follow through infection in the fracture area, the tendency seems to be for the mylohyoid muscle to pull the sides of the mandible together, causing a narrowing of the lower dental arch. In order to offset any tendency of this nature, we make it a routine rule in cases of fracture in the symphysis region to get our fixation by the arch-band method. Bending the lower arch band to conform with the normal curve of the lower dental arch, wiring it securely to all the teeth possible, doing the same with the upper arch band, and getting our intermaxillary fixation by means of elastic bands hooked between upper and lower arch wires. In this way the normal curve of the lower dental arch is preserved, regardless of what happens in the fracture area.

Next in frequency of occurrence in this series of 50 cases, was the double fracture. Five have been fractures of this type. Three of these presenting the combination of fracture in the mental foramen region with a fracture through the angle on the opposite side, and the other two presenting a fracture in the mental foramen region also, but with the neck of the condyle fractured on the opposite side rather than the angle.

The treatment of the bilateral fracture is complicated by the fact that the elevator muscles (i.e., masseter, temporals, and pterygoids) tend to pull up the side segments, while the middle segment (formed by the fractures on either side) is depressed by the hyoid group of muscles. An upward and backward traction must be applied to this middle fragment, in these cases, to bring the fragments in proper alignment and the teeth up into normal occlusion. This can be done by proper placing of our wires, although frequently it is necessary to daily increase the tension on the wires over a period of 5 or 6 days before reduction is complete and occlusion normal again. We think

it safer in these double fractures, where there is a strong contrary muscle pull to prolong our period of immobilization, keeping the wires on as long as 8 weeks in some cases, rather than the 4- or 5-week period which we use normally.

Fractures through the neck of the condyle, which 3 of this series have been, we handle by wiring with the "eyelet" method for the usual 4- or 5-week period. The one fracture of this group, through the coronoid process, we wired for 3 weeks, at the end of this time putting the patient back on regular diet to overcome any tendency toward trismus from adhesion formation.

The type cases enumerated thus far, which we handle by some form of wiring, make up about 85 percent of our fracture work. However, occasionally in our older patients (generally Veterans' Bureau patients) where the mouth is edentulous or partially so, we get the more atypical case which must be handled by other methods.

Where the case is entirely edentulous we use a vulcanite splint in the mouth, together with a headgear consisting of chin cup and head strop. This combination gives a satisfactory means of fixation, although there is a tendency for some resulting misalignment of fragments or change in the bite, due to the fact that it is impossible to get a tight fixation with a gear of this type. However, this can be overlooked providing a good union is secured, as any deviation from normal alignment or bite can be compensated for when dentures are constructed later.

The most difficult of these less typical cases, where a splint must be used, is the problem presented following a fracture in the bicuspid region where the long posterior fragment, thus formed, is edentulous. The tendency in these cases is for the elevator muscles to pull this long edentulous fragment up so far out of alignment with the rest of the mandible that union is impossible, and also a marked facial deformity results.

Some men today are using the Darcissac operation, consisting essentially of an external skin incision at the angle, drilling a hole through the mandible at the angle, through which a wire is passed and brought out through the external incision where it is connected by an elastic band to an extension from a plaster paris head cap. This technique for the control of the long edentulous posterior fragment is reported as quite successful; however, we have handled, in this series, three cases presenting this particular problem, using non-operative measures, treating the cases by a vulcanite appliance in the mouth, with successful results in every case. The objection to the use of splints in these cases seems to be the tendency for a pressure necrosis which develops beneath the saddle constructed to control the long edentulous segment. However, by daily adjustments, irrigation, etc., and by keeping the patient constantly impressed with

the necessity for proper mouth hygiene, we have handled these cases with no pressure necrosis developing.

Inasmuch as this problem is one of general interest to anyone doing this work, we have included a case report of a fracture of this type, together with the radiographic record of the progress of the case.

#### CASE REPORT

*A. J. M.—Veteran. Age 40.*—Admitted with compound, comminuted fracture, left side of mandible involving bicuspid teeth. "Hit by a friend."

We can predict almost with certainty that osteomyelitis will develop here as the bone is considerably comminuted and there is considerable sloughing of the surrounding soft tissue from the impact of the blow. Following the removal of the involved teeth infection developed in the fracture line with purulent discharge from the tooth sockets.

*Figure 1.*—Shows a photograph of a model of the case with appliance used. At the time the impression for the model was taken, the long edentulous posterior fragment was freely movable and had been pulled up far out of normal alignment by the elevator muscles. A marked concavity existed in the external contour of the patient's face at this time. This illustration also shows the appliance used. Made of vulcanite, covering the palate and wired to the upper teeth, with an extension and saddle to control the position of the long fragment. A slight flange will be noticed on the lingual side to counteract the inward pull of the mylohyoid muscle.

When the long edentulous posterior fragment had been worked down into proper position and the anterior teeth wired together, our appliance held the segments in good alignment.

*Figure 2.*—Shows an X-ray of the case several weeks later, with the appliance in place. A fairly large area of bone involvement can be noticed due to the osteomyelitis, however the segments are held in good position by the appliance. This splint was kept on 8 weeks, seeing the patient routinely every day, unwiring and irrigating the wound at the site of the fracture, then immobilizing again. At the end of this period all clinical evidence of the osteomyelitis had cleared up, and X-rays at that time showed enough callus formation to warrant removal of the appliance.

X-ray of the case 4 months from time fracture occurred shows the area of bone involvement due to the infection and the fracture line are both being gradually obliterated by new bone formation, alignment of the fragments is practically normal.

We were so fortunate as to obtain an X-ray of the case 1 year from the time the fracture occurred. Practically no evidence of fracture was to be seen. The patient is now having dentures constructed to restore his lost masticatory function.

#### COMMENTS

Of this group of 50 fractures we were fortunate in securing at least a beginning bony union, before discharging the patient, in every case except one. This was a pathologic fracture occurring shortly before death from other causes, and for which no fixation was attempted. We think our uniformly successful results due in part to the fact that we keep our patients under constant observation.

They are given no liberty while wires or appliances are in place. We see them routinely for a few minutes every day for necessary adjustment. Keeping them reminded at all times of the necessity of proper mouth hygiene. We are fortunate also in having excellent X-ray facilities which enable us to keep a radiographic check on the progress of our cases at all times during the treatment period.

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**SPINAL ANESTHESIA—REPORT OF ONE HUNDRED AND TWENTY-FIVE CASES**

By GERARD B. CREAGH, Lieutenant (Junior grade), Medical Corps United States Navy

With the increasing opposition to spinal anesthesia, the frequent caution against its routine use, and its discontinuance by some of the leaders in the profession, one presents so small a series as ours with considerable reservation. It is significant, however, that with the rapidly increasing use of spinal anesthesia in the Navy (2 to 6 times as frequent as inhalation narcosis in 1932) no casualties or unusual immediate or delayed effects have been reported. It should be further remembered that statistics including men largely in the second decade of life, whose general health is nowhere excelled as a class, and surgery limited largely to the lower abdomen, cannot be fairly compared to the statistics upon patients of all ages from civil life.

The following report is submitted to show the value of spinal anesthesia as employed in one of the smaller naval hospitals, where a trained anesthetist was not always available, and where a frequent change in operating-room personnel was encountered. One hundred and twenty-five cases were closely observed at the United States Naval Hospital, Parris Island, S.C. Spinal anesthesia was not used routinely, but was selected as the anesthesia of choice in the majority of cases. The psychic and physical condition of the patient, together with the surgical procedure to be undertaken, were preliminary considerations in selecting the type of anesthesia.

Procaine hydrochloride crystals were used in every case. Blood pressure was recorded before injection and at regular intervals during operation. One hundred and fifty (150) mg was the dosage employed for most abdominal work. The puncture was preferably made with the patient in the upright posture, sitting across the operating table, feet resting on a stool. The site of puncture was usually between the second and third lumbar vertebra. One cubic centimeter of ephedrine was administered 10 minutes before the spinal puncture in all but a few cases. In these few cases not receiving the ephedrine, the fall in blood pressure was greater, and

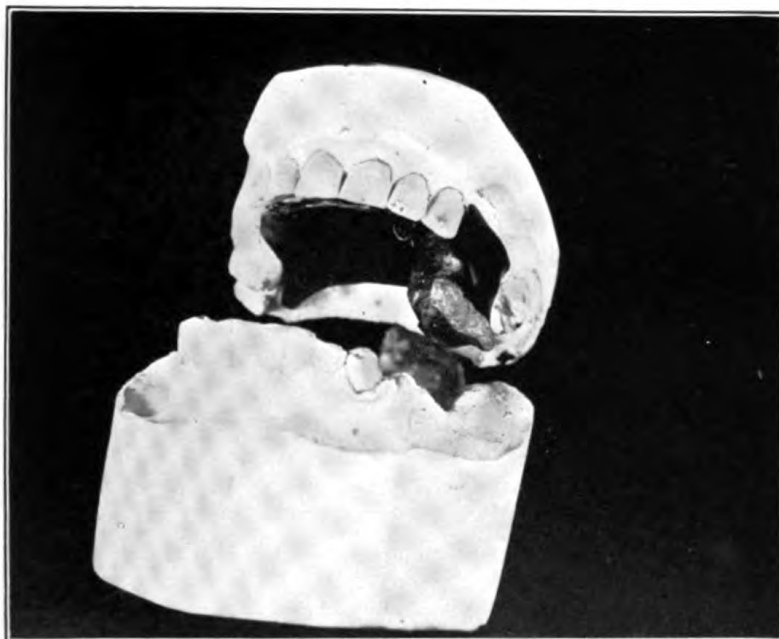


FIGURE 1.—ILLUSTRATION OF APPLIANCE.

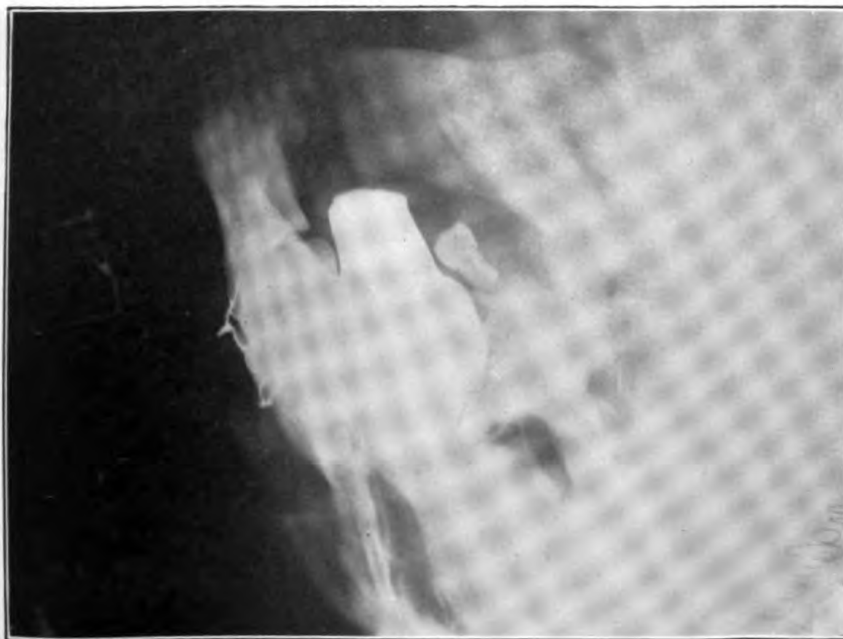


FIGURE 2.—SUBSEQUENT LOSS OF BONE SUBSTANCE AND APPLIANCE IN PLACE.



symptoms such as pallor, restlessness, profuse sweats, and epigastric uneasiness were frequent.

Morphine was used preoperatively in all cases, and sodium amytal in a few additional ones with comfort to the apprehensive, sensitive individual. Several of the barbituric acid derivatives may be employed satisfactorily for preanesthetic hypnosis. The drug selected should be given the night before operation and repeated in the morning, thus attaining the maximum therapeutic effect by the time the patient is ready for the spinal injection. Morphine is given just before the patient leaves the ward for the operating room.

*Technique.*—Four cubic centimeters of spinal fluid were collected in a graduated medicine glass containing the novocaine, mixed, and reinjected slowly. Barbotage is unnecessary. The withdrawal of a small amount of the fluid after injection insures that the solution went intraspinally.

Skillful puncture with a small-gage, properly beveled needle is undoubtedly a factor in lessening post-anesthetic backache.

Immediately after the novocaine solution has been injected the patient is placed on his back, flat on the level table. This will usually produce anesthesia to the costal margin in 15 to 20 minutes. For upper abdominal work, requiring a higher level of anesthesia, the table should be tilted, head downward, about 15°.

The novocaine first gravitates caudalward, resulting in anesthetization of the sacral nerves, with anesthesia of the perineum. The legs, lower abdomen, and an area extending to the costal margin become anesthetized in the order named, the process reversing itself as anesthesia subsides. Anesthesia may be limited to the perineum by keeping the patient in an upright position until fixation has occurred, or may be produced unilaterally in the lower extremities if he be allowed to remain prone on his side. We have noted an occasional change in the level of anesthesia upon shifting the position of the patient, 15 to 20 minutes after induction, thus indicating that novocaine does not always become fixed as readily as is sometimes anticipated. An exaggerated Trendelenburg position should, therefore, be avoided immediately after the introduction of the crystals.

As previously stated, 150 mg of procaine hydrochloride crystals was the usual dosage for lower abdominal work. For upper abdominal work, or for a procedure requiring more time, 200 mg to 250 mg should be employed. On 12 rectal and perineal cases, we used 100 mg without supplemental anesthesia. This dosage proved insufficient, however, for abdominal work.

The average duration of anesthesia in our cases was 1 hour and 15 minutes. Inhalation anesthesia was required to complete 3 prolonged

operations, and local infiltration 12 additional ones. The latter procedure can be accomplished with very little discomfort to the patient. Inhalation narcosis superimposed upon a spinal anesthesia involving the intercostal muscles should be avoided if possible.

A temporary fall in blood pressure, together with a slight retardation of pulse rate, was noted in every case without exception. Respiration was usually somewhat shallow, the rate remained fairly constant. Ferguson and North in a recent article on the physiology of spinal anesthesia state that the fall in blood pressure is probably due to "a participation of all the vasomotor elements in the maintenance of vasomotor tone, and the degree of blood-pressure depression resulting is in direct ratio to the number of white rami anesthetized, and not primarily to splanchnic dilatation." (*Surg. Gynec. Obst.* 1932, LIV, 621).

Vasodilation might also be a factor in producing a more viscid, tenacious type of tracheobronchial secretion, which in the presence of impaired respiration, might be cause for considerable embarrassment.

Stabilization of the blood pressure with ephedrine, a peripherally acting vasoconstrictor, seems to rest upon a favorable physiological and clinical basis, viz, by increasing resistance to blood flow in the peripheral vessels. The fact that ephedrine is no longer used as a preanesthetic measure and without untoward results, is frequently mentioned in the literature, however.

We believe that large doses of procaine, high levels of anesthesia, the withholding of ephedrine, and prolonged work about the diaphragm under anesthesia that involves the intercostal muscles, are factors that contribute to the frequently reported high incidence of pulmonary complications following spinal anesthesia.

In our cases, satisfactory anesthesia with its resultant unparalleled abdominal relaxation, was obtained in all but a single instance. In this case no anesthesia whatsoever developed, though the same technique and drug was employed. In another case we were unable to produce anesthesia above the level of the umbilicus, although complete anesthesia of the lower extremities was present.

No clinical evidence of any immediate toxic effect on the cord was noted in any case. Postoperative vomiting was decidedly less frequent than after inhalation narcosis.

With the relatively small dosages of novocaine employed, we had no severe reactions of any type. Vomiting immediately after the introduction of novocaine was noted in three cases, this subsiding without undue delay. About 10 percent experienced postoperative headache at one time or another. Posture of the patient after being returned to the ward did not seem to be a factor in preventing this, but once present, the symptoms were frequently



exaggerated when the patient sat up in bed. The larger the dose of novocaine, the more frequently was headache encountered and it was very resistant to the usual drugs. No pulmonary complications resulted that were worthy of note. No prolonged discomfort referable to the anesthesia was encountered while the patients remained under observation. Several cases underwent prolonged hospitalization for 3 or 4 months for concurrent disease and were closely observed for any unusual neurological manifestations.

In this comparatively small series of cases, with the great majority of the patients being ideal surgical risks, and with the greater part of the operative work being confined to the lower abdomen, we feel that spinal anesthesia was definitely superior to any form of inhalation narcosis as we employed it.

Some of the more common complications are briefly considered. Cardiovascular collapse is nearly always associated with high anesthesia. Predisposing factors are the early Trendelenburg position, withholding of ephedrine, large dosage, idiosyncracies, and debilitation in the patient. Atelectasis is frequently mentioned as a fairly common immediate complication of spinal anesthesia and can largely be prevented by restricting the level of anesthesia below the diaphragm, insuring a normal respiratory excursion and thorough oxygenation. Other factors to be considered are the patient's general condition; prolonged Trendelenburg position, with the abdominal viscera compressing the chest cavity; deep preanesthetic hypnosis interfering with normal respiration. Hyperventilation with carbon dioxide and oxygen should be employed if there is any evidence of respiratory impairment.

Respiratory failure results when the thoracic muscles have become anesthetized, and the anesthetic solution in the spinal canal reaches the second or third cervical segment in sufficient concentration to block the phrenic nerve. Such a contingency is early suggested by diaphragmatic breathing as the intercostal musculature becomes impaired. The medullary respiratory mechanism may fail through a combination of the anesthesia and insufficient blood. Treatment is artificial respiration, with oxygen inhalation, and cardiovascular support.

Less serious delayed complications, e.g., postanesthetic headaches are difficult to prevent at times; their etiology is often obscure; backache usually results from trauma at the site of puncture. Permanent cord damage has been reported in a few cases, and while relatively infrequently encountered, is the most important single factor in determining the future continued use of spinal anesthesia.



## CLINICAL NOTES

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### GAS-BACILLUS INFECTION

By ARTHUR H. DEARING, Lieutenant Commander, Medical Corps, United States Navy

The possibility of infection with gas bacillus must always be borne in mind when treating compound fractures. During the period from July 1, 1932, to July 1, 1933, 36 compound fractures were admitted to the U.S.S. *Relief*. One of these cases was complicated by gas-bacillus infection. This case is reported because it illustrates the usual mode of infection, the value of early diagnosis, and a favorable outcome with the use of large doses of antitoxin early in the disease.

*J. B. U., bmkr. 2/c*, was injured at about 3 a.m. on Sunday, May 21, 1933. The motorcycle he was riding collided with an automobile at a street intersection in Los Angeles, Calif. He was not unconscious. Soon after the accident he was admitted to a civilian hospital in that city, where he remained for about 12 hours, and was then transferred to the U.S.S. *Relief* as a stretcher case. The following summary of the treatment given at that hospital was received with the patient:

"Compound fracture of right ankle. There is a deep contusion over the outer border of the ankle and a 3-inch contused laceration over the inner border. The end of the tibia, which is dirty, protrudes through this laceration. There are superficial lacerations and abrasions of the right leg and left knee. Under gas-oxygen anesthesia the lower third of the leg was shaved and prepared with ether and iodine. Protruding end of bone scrubbed with sterile soap and water, iodized, and cleaned with ether. Fracture reduced, wound edges trimmed. Skin lightly sutured about one rubber tissue drain and ankle splinted in inversion. Given antitetanic serum."

On admission to the hospital ship he was in considerable pain but otherwise seemed in good condition. Temperature, 98.8°; pulse, 120; respiration, 18. The right lower extremity was encased in a wooden splint. Seen by the medical officer of day and X-ray taken without removing the splint. This showed a comminuted fracture of the right tibia about 4 cm above the ankle and a fracture of the right fibula about 7 cm above the ankle, with about 1 cm overlapping of the fragments.

*Past history.*—Typhoid fever at age of 14 followed by pneumonia. No previous injuries or operations. Contracted syphilis 2 years ago.

*Family history.*—Negative.

*General physical examination.*—Showed no abnormality aside from superficial abrasions of the face, left knee, and left hand. Blood pressure, 132/78.

*May 22, 1933.*—Patient given spinal anesthesia at 8 a.m. and splint removed from the right leg. There was considerable blood on the dressing over the wound on the inner side of the ankle and there was a very foul-smelling

serosanguineous discharge from this region. There was some brawny swelling of the front and calf of the leg with a suggestion of crepitus in the contused area over the external malleolus. The drain and all sutures were removed and the wound laid widely open.

A Kirchner wire was placed in the os calcis for traction and the leg placed in a Thomas splint with Pearson attachment. Smear and culture made from the wound secretions. A continuous wet dressing of 1:1,000 potassium permanganate solution was placed on the open wound. At this time the W.B.C. was 31,000 with 6 juveniles, 7 band forms, 77 segmented, and 10 lymphocytes.

Stained smears from the wound secretions showed an organism resembling *B. Welchii* and 6 hours after planting, the cultures showed definite gas formation. At 5 p.m. the patient was given intravenously 20,000 units of polyvalent anti-anaerobic antitoxin (Parke-Davis) with no untoward results.

**May 23, 1933.**—Patient's general condition was excellent. On the leg there was an area of dusky redness surrounding the ankle and extending upward to just above the knee on the outer side and just below the knee on the inner side. This was not tender and did not crepitate. X-ray taken for soft tissue detail showed evidence of gas in the tissues on the outer aspect of the mid calf and immediately around the fracture.

Under gas-oxygen anesthesia 4-inch longitudinal incisions were made down to and including the fascia covering the muscles at the following sites: Outer side of leg behind the external malleolus, outer side of calf anterior aspect of leg and inner side of calf. The first incision was deepened (under the Achilles tendon) to give counter drainage to the fracture area. At all incisions the subcutaneous tissue appeared to be dirty-gray or black and did not bleed. The deep fascia was normal in appearance, as was the muscle substance which contracted readily. Dakin's tubes were placed in the fracture region and this was irrigated with 1:1000 potassium permanganate solution every hour. The other operative wounds were kept continually moist with a similar solution. Given 20,000 units of polyvalent antitoxin.

**May 24, 1933.**—The area of redness on the outer side of the leg had extended to mid thigh and was about 4 inches wide. Another 6-inch incision was made to but not through the fascia lata in this region disclosing discolored subcutaneous tissue. The wet dressings of potassium permanganate were continued, and patient given 20,000 units of antitoxin intravenously at 10 a.m. and 8 p.m.

**May 25, 1933.**—The reddened areas had begun to fade to a mottled brown appearance and the general condition of the patient had improved. W.B.C. 15,400, with 93 percent neutrophils. The temperature was beginning to recede. Twenty thousand units of antitoxin (Cutter) were given at 10 a.m. and 8 p.m. Each was followed by a slight chill and rise in temperature, which soon fell. The wet dressings were continued.

**May 29, 1933.**—All the incised wounds now presented pink, granulation tissue. The mottled brown areas were rapidly fading and although there was a purulent discharge from the fracture site, there were no *B. Welchii* present on smear or culture. The wet dressings of potassium permanganate were discontinued.

On June 21, 1933, all wounds were epithelializing, the wire was removed from the heel, and the leg encased in a plaster splint prior to transfer to a naval hospital on June 29, 1933.

#### SUMMARY

1. A case of compound, comminuted fracture of the right tibia and fibula with gas bacillus infection demonstrated clinically and

by laboratory means 30 hours after the injury and extending rapidly upward.

2. The proximal fragment of the tibia had evidently been thrust through the skin and ground in the dirt of the pavement. There was extensive contusion and laceration of the soft tissues about the fracture, which furnished an excellent medium for the growth of *B. Welchii*.

3. Treatment consisted of multiple incisions, wet dressings of potassium permanganate solution, and intravenous administration of a polyvalent anti-anaerobic antitoxin. Six doses of antitoxin of 20,000 units each were given in 4 days.

4. The extension of the process was halted within 48 hours of the institution of treatment with antitoxin and all evidences of gas-bacillus infection were absent within a week.

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### ADHERENT PLACENTA

#### REPORT OF A CASE RESULTING IN MATERNAL DEATH

By CARL V. GREEN, Jr., Lieutenant (Jr. Gr.), Medical Corps, United States Navy

Adherent placenta, also termed placenta accreta, is explained by Polak (1) as being the result of an entire or almost entire absence of the decidua basalis, which exposes the muscle of the uterine wall to the erosive action of the trophoblast and penetration of the villi. This intimate union of placenta and muscle wall, he continues, makes it impossible to find any line of cleavage for placental separation. Attempts at manual removal, Salmond (2) states, results either in severe hemorrhage or sometimes rupture of the uterus. Polak recommends hysterectomy if the condition is diagnosed. The condition may be suspected in patients who have had previous manual removals of placenta, frequent curettage, and endometritis.

The etiology, according to Polak, depends upon changes which produce an atrophy or absence of the normal uterine decidua: Submucous myomata, etc. In a true placenta accreta there is no line of cleavage, for the placenta is not only an intimate part of the muscular wall, but the erosive action has so thinned this wall that attempts at removal produce hemorrhages and open up avenues of infection and even permit perforation of the uterus. Unlike retention of the separated placenta, provided there has been no manipulation to cause partial detachment, there is no hemorrhage, descent of the cord, or change in the position of the fundus, and the fundus assumes a characteristic shape, being broader from side to side and intermittently relaxed, not assuming the firm contraction and ball-like shape present

in the separated placenta. In his series the incidence of placenta accreta is about 1 to 6,000 cases.

Klaften, in 1928 (quoted by Kwartan (3)) collected 45 cases, and Joachimovitz, in 1929, collected 25. Klosterman (1929) (4) reported a case with uterine rupture, but could not show its etiology. Klaften found only one case in 14,000 and Nathanson observed one case in 20,000 deliveries.

Beside maldevelopment of the uterus, infantile uterus with atrophy or hypoplasia of the endometrium, Kwartan adds as etiologic factors excessive growth of the chorionic elements, and insufficient antiferment production against the erosive power of the trophoblast.

This condition is described by Jackson (5) as a pathological entity; he sums up its pathology as referred to above by the authors. At Boston Lying-in Hospital, he states: In 14,648 cases from 1916 to 1926 two cases were discovered. Any attempt to remove the placenta piecemeal is condemned. If profuse bleeding follows attempts at manual removal, tamponade of the uterus may be used temporarily while preparations are made for abdominal hysterectomy. Administration of normal saline by various routes is advised in the interval of waiting. If hemorrhage predominates, blood transfusion should precede or accompany the abdominal operation. The final attempt, when the usual methods of removal of the placenta by the vaginal route have failed, should be immediate supra-vaginal hysterectomy. There is a rather complete unanimity of opinion on this score. Jackson presents 6 cases.

In Forster's (6) case the placenta, of varying thickness covering the whole of the interior of the uterus, helped to confirm the diagnosis. Following Polak's dictum, aseptic exploration under anesthesia was made to determine the procedure, which was hysterectomy. Feiner (7) followed this procedure in his case. The bulk of the placental tissue was located in the fundus; the peripheral portion could be enucleated, but higher up separation became impossible, and either placental tissue was left behind or the muscle tissue was torn into.

Wilson (8) discusses a case of placenta accreta with gangrene of the uterus, pelvic peritonitis, venous thrombosis, and gangrene of the lower extremities. The infection, he believes, was present in the uterus before the patient entered the hospital and was probably held in check by a well-formed leucocytic zone. Aside from such cases as this, the prognosis is held to be good.

Dorsett (9) reports a few cases and recommends conservative measures. Smith (10) reports a case and reviews the literature. The essentials of the presented case will now be given:

*Mrs. R. J. H.*, 26 years, was admitted to the hospital on June 8, 1933, in labor. The patient gave a history of smallpox (?) at the age of 5 and of a

miscarriage in May of 1930 when at 7 months' term. While hospitalized for this condition, syphilis was discovered. She told of having received some antiluetic treatment but did not remember the amount.

Following the delivery of this stillborn infant she had a rather stormy convalescence and remained in the hospital for a 5-week period. The present pregnancy was essentially normal save for considerable nausea and vomiting during the first trimester.

Examination upon admission showed the pelvic measurements to be within normal limits. There was evidence of some anemia. There were some skin lesions present which were suggestive of old syphilide. The urine showed a trace of sugar present, a moderate amount of white blood cells, and a few granular and hyaline casts. The patient also stated that there had been some hearing difficulty present for the past 2 years and that it had been becoming progressively worse.

The first stage had its onset at 4 p.m. and was complete at 5 a.m. the following day. The second stage was complete at 5:16 with the delivery of a living female infant; there were no lacerations. The loss of blood following delivery approximated 500 cc. At the end of 15 minutes mild pressure was applied to the fundus to aid delivery of the placenta; and after 30 minutes attempts by the Crede method were resorted to. After 1 hour manual extraction was attempted. The organ seemed to be intimately attached to the uterine wall, and no line of cleavage could be detected by the exploring hand. External palpation at this time revealed the fundus to be still high and not contracted at all.

Following the delivery of the child, it was noted that the patient appeared markedly anemic, although she seemed to be in no distress and conversed with her husband and the nurses present. At the end of a 45-minute period she seemed rather exhausted and slept fitfully. Shortly after this there was evidence of impending collapse; and the attempts at removal of the placenta having failed, all efforts were directed toward the combating of this condition. External heat, stimulants, circulatory and respiratory, and finally artificial respiration were resorted to. In spite of all measures, the patient expired. Permission for autopsy was obtained.

#### AUTOPSY REPORT

The body is that of a female adult about 26 years of age. The body is well developed and nourished.

There is marked anemia of skin and mucous membranes. The heart was negative save for the paleness of the organ. The lungs were negative. The spleen was normal in size but pale.

The kidneys were likewise pale and presented a rather granular appearance. The uterus was large and rather soft. The adnexal structures were negative. The uterus upon opening showed the placenta to be completely adherent to the cavity throughout. There were numerous fibrous bands visible about the periphery of the organ. There was some apparent scarring of the placental structure. No line of cleavage was demonstrable between uterus and placenta; and a glistening membrane was present which covered the entire cavity of the uterus and held the placenta firmly in place.

*Histological examination.*—The placenta shows moderate fibrosis. The membrane over the fetal surface of the placenta is somewhat fibrous and is continuous with the membrane lining the uterine cavity and is bound to the uterine wall by fibrous tissue.

*Pathological diagnosis.*—Adherent placenta.

Endometritis has been mentioned as an etiologic factor in this rather infrequent condition of adherent placenta. An endometritis was in all probability the responsible factor in this case, but of a luetic origin. It seems reasonable to conclude that the 5 weeks of hospitalization which were necessary at the time of delivery of the stillborn infant were due to complications arising out of the condition of diseased endometrium. Syphilis has been mentioned in obstetrical texts as responsible for both adherent placenta and for disease of the placental structure proper; and it is a well-known fact that it is capable of increasing the hazards of pregnancy many-fold; and it has been well established that pregnancy severely aggravates the anemia incident to syphilis.

Ahlfeld (quoted by De Lee) concludes that the average blood loss during labor is 505 cc, and that a loss up to 800 cc may be considered as normal. The loss of blood in this case was not over 600 cc. De Lee, however, points out that the loss of a lesser quantity of blood may be fatal to some individuals; and again it appears that in this case, the loss of the amount of 600 cc of blood was sufficient to account for the fatal outcome.

#### SUMMARY

A case of adherent placenta is reported in which it definitely appears that syphilis was the etiologic factor.

In view of the existing anemia present at the time, and which was likely due to both the specific disease as well as pregnancy, the blood loss, which was well within normal limits, was sufficient to bring about a fatal outcome.

Cases of placenta accreta are rare and their diagnosis may be inferred when a placenta fails to deliver within a 2-hour period. It may be further confirmed by the hand within the uterus when no line of cleavage is detectable.

The treatment, when diagnosed, is hysterectomy, and those measures which would lessen the surgical hazards; namely: fluids by vein, etc., and in certain cases blood transfusion.

#### BIBLIOGRAPHY

1. Polak, J. O., and Phelan, G. W.: Placenta accreta; incidence, pathology, and management, *Surg. Gynec. and Obst.* 38: 181-185, 1924.
2. Salmond, M.: The morbidity of adherent placenta. *J. Obst. and Gynec. Brit. Emp.* 39: 346-356, 1932.
3. Kwartin, B., and Adler, N. H.: Placenta accreta, *Am. Jour. Obs. and Gyn.* 20: 703-707, 1930.
4. Klostermann, H.: Placenta accreta: case, *Med. Klin.* 25: 713-714, 1929.
5. Jackson, D. L.: Placenta accreta, *New York St. Jour. med.* 28: 1207-1210, 1928.



6. Forster, D. S.: A case of placenta accreta, *Canad. med. Assoc. Jour.* 17: 204-207, 1927.
  7. Feiner, D.: Placenta accreta, *Am. J. Obs. and Gynec.* 22: 312-317, 1931.
  8. Wilson, R. A.: Case of placenta accreta; treatment and usual sequelae, *Am. J. Obst. and Gynec.* 17: 58-66, 1929.
  9. Dorsett, E. L.: Placenta accreta; conservative vs. radical treatment. *Am. J. Obst. and Gynec.* 25: 274-280, 1933.
  10. Smith, R. K.: Case of placenta accreta; and review of literature, *South-western Med.* 17: 55-58, 1929.
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#### ANEURYSM OF SINUS OF VALSALVA WITH RUPTURE INTO RIGHT AURICLE AND DEATH

By A. R. HIGGINS, Lieutenant (Jr. Gr.), Medical Corps, United States Navy

The literature presents few authentic cases of aneurysm of the sinus of Valsalva; and none with rupture of such an aneurysm as a probable cause of death. Such a case is here presented.

Stolting, in 1909, reported the case of a woman of 35, with a history of cardiac valvular disease of 15 years' duration, who at necropsy showed an aneurysmal defect in the left sinus of Valsalva, filled with an organized thrombus. He also refers to his own case of aneurysm of the first portion of the aorta, involving the left aortic sinus.

Sommer, in 1910, recorded 2 cases, 1 of aneurysm of the right aortic sinus in a luetic male of 44 years, and a second of aneurysm of the left aortic sinus in a female of 37 years. He also reviewed several cases reputed to be aortic sinus aneurysm, which, however, do not appear to be valid cases, since in most instances the whole first part of the aorta was involved in an arteriosclerotic or luetic dilatation, the involvement of the aortic sinus being only incidental. Sommer attempted to account on physiological grounds for the usual localization of the lesion in the left sinus, alleging as the cause the strain, through torsion of the heart and aorta, to which the left sinus is subjected, during left ventricular diastole, by the elastic recoil of the aorta. His assumption would appear to be insufficiently founded, since too few cases are reported to avoid the error of coincidence. The subject case, however, involves the left posterior sinus.

W. B., male, mulatto, veteran, 52, was first hospitalized in August 1932 with an apparently typical first attack of acute rheumatic fever. The left ankle, and subsequently the wrists, right shoulder, and vertebral column were involved. Past history included typhoid 25 years previously. One year prior to admission there had been symptoms of an infection of the left face and eye suggesting trigeminal neuralgia. These complaints were not present on admission.

There was no clinical evidence of a cardiac lesion during this attack of rheumatic fever. An electrocardiogram showed evidence of left-sided preponderance and some degree of myocardial damage. Blood pressure, 170/100;

Kahn reaction negative. A tonsillectomy was performed and no. 19 tooth extracted for periapical abscess. Recovery was uninterrupted, and the patient was discharged, cured, in 6 weeks.

In November 1932 the man was readmitted, complaining of numbness and weakness of the right arm and right side of the face, with difficulty of speech, of 1 day's duration. He had contracted a severe cold two weeks prior to admission. There was no complaint of loss of strength in the right leg.

The patient was emaciated and obviously quite ill. There were weakness and poor coordination of movements of the right arm. No weakness of right face was demonstrated. The reflexes of the right arm were exaggerated; those of right leg unchanged. Sensation of right arm and lower right face was depressed. Test phrases repeated with little difficulty.

The heart was rapid (104), regular in rhythm. No enlargement was noted. A definite precordial thrill was felt, and a "to and fro" murmur heard, loudest over the mitral area, but transmitted into the left axilla and back. Early and midsystolic phases of this murmur were rough. No evidence of arteriosclerosis in the radial or brachial arteries. The blood Kahn was again negative. The urinalysis and blood picture were not abnormal.

Six days after admission, while apparently improving steadily, the patient suddenly became acutely dyspneic and died in about 1 hour.

At autopsy there was found an old fibrinous pleuritis over the apical and diaphragmatic surfaces of the left lung. The liver showed moderately increased "nutmeg" markings. Kidneys appeared grossly normal. The brain showed diffuse pinpoint focal hemorrhages, old and recent. In the left pre-central gyrus, 1.5 cm from the cortical surface, was an old area of hemorrhage 1.5 cm in diameter with considerable organization of the clot. Impinging on this area was a smaller, more recent area of hemorrhage, 0.5 cm in diameter. The arteries of the base of the brain showed mild arteriosclerotic changes.

The most interesting findings were in the heart. There was an enlargement to half again the normal size. Weight 460 gms. The pericardium appeared normal. The left ventricular myocardium was greatly hypertrophied, as was that of the left auricle. The mitral valve showed some calcification and thickening of the free valvular edges, with little deformity.

The aorta showed thickening of the valvular edges, and linear intimal thickening and puckering in the first part of the ascending aorta, which was believed to be probably the result of a syphilitic aortitis. The coronary ostia and arteries were free from obstruction or scarring throughout.

In the left posterior sinus of Valsalva, next the posterior origin of the valve cusp from the aortic wall, was a defect in the sinus wall 0.7 cm in diameter, partially filled by organizing blood clot. This clot, however, did not fill the defect completely; there was a patent opening which could be followed directly through the septum into the right auricle. In the right auricle this opening appeared as a bulging area in the floor, 1.0 cm in diameter, in the center of which was the opening from the aortic sinus already described. Beside this larger defect and separated from it by a bridge of firm tissue 0.3 cm there was another smaller opening 0.2 cm in diameter, leading into the cavity of the aneurysm. The posterior edge of the left aortic cusp was torn free from its aortic origin.

Microscopic anatomy showed with routine stains hypertrophy of the ventricular myocardium with some increase in fibrous tissue.

Rheumatic nodules (Aschoff bodies) were not found, in spite of a fairly definite clinical history of rheumatic fever. The aorta showed

perivascular round-cell infiltration about the vasa vasorum with focal areas of necrosis. *Treponemata pallida* were not demonstrated with Warthin-Starry technic. The etiology of the lesions noted must remain in doubt, in the absence of confirmatory microscopic findings of either rheumatic or luetic origin.

The cause of death is an interesting conjecture. There had been no previous history of cardiac decompensation, and the clinical picture was that of cerebral hemorrhage with apparent clinical improvement until the sudden acutely dyspneic death, suggestive of a cardiac accident. The most plausible cause of death would appear to be the rupture of the aneurysm noted in the left posterior sinus of Valsalva into the right auricle.

#### SUMMARY

A case of aneurysm of the left posterior sinus of Valsalva, with rupture into right auricle and death, is presented, with review of literature and discussion of case.

#### BIBLIOGRAPHY

1. Kaufmann, E.: "Pathology", volume I.
2. Stolting: I-D, Greifswald, June 1909.
3. Sommer: Frank, Zeit. 5, 1910.

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#### A CASE OF CHOLELITHIASIS WITH OBSTRUCTION OF THE COMMON DUCT

By ALANSON L. BRYAN, Lieutenant Commander, Medical Corps, United States Navy

Fifty-one years ago Langenbuch removed the first gall bladder as an empiric method of treatment for cholelithiasis. Advancement in the diagnosis and treatment of biliary diseases have been due largely to the empiric type of treatment originally undertaken, and to conclusions drawn from clinical data, surgical, X-ray, bacteriological, and pathological study of the cases during the past half century.

Embryologically the gall bladder, the biliary ducts, the liver, duodenum, and pancreas arise from the same nest of cells. The gall bladder is a diverticulum of the excretory duct of the liver; it develops as a small bud on the side of the common duct and becomes the reservoir for bile. A rich lymphatic network in the walls of the gall bladder connect freely with the periportal lymphatics about the common and hepatic ducts. This explains why periportal inflammation and lymph nodes are found about the ducts in cholecystitis. We believe that in the following case the inflammation and edema in this network of lymphatics spread and was sufficient to create obstruction of the common bile duct.

In acute cholecystitis cholecystography is contra indicated. A careful physical examination and a well-elicited history are still our

chief factors in determining the pathological condition of acute cholecystitis. Of laboratory tests the Icterus Index will measure increasing or decreasing jaundice more accurately than will the eye. The Van den Bergh reaction may differentiate obstructive and hemolytic jaundice, but it cannot localize the obstruction. The white blood count is of value, especially the differential count.

The choice between cholecystectomy and cholecystostomy must be based on experience and surgical judgment to meet the individual indication. It is conceded that the least amount of operative interference should be added to the necessary common duct exploration. The following case is especially interesting in regard to this rule:

*P. J., Filipino, age 36, was admitted to the Naval Hospital, Mare Island, February 20, 1933. His chief complaint was pain in the abdomen and vomiting for the past 2 days. (He was unable to answer many questions on account of being very ill.) Two days ago he suddenly had an attack of vomiting after dinner. Following the vomiting he had severe cramplike pains in his right upper quadrant. The pain had been almost constant since, with nausea and vomiting. He had not eaten any food since onset because of nausea. He has had several enemata, but no cathartics. The pain was referred to his left shoulder. (Left shoulder was verified.)*

*Past history.*—Four years ago he had a similar attack which subsided in several days. Since that time he has had no complaints except constipation. He states that all foods agree with him and that no food gives him any distress or pain.

*Physical examination.*—An acutely ill adult male lying in a doubled-up position in bed. Skin is dry and appears to have icteric tinge. It is difficult to be certain because of color (Filipino). Sclera and mucous membrane appear icteric.

*Chest:* Lungs are clear. The superficial veins of his chest and especially the superficial veins of the right side of the abdomen are dilated. The heart is within normal limits—rate rapid. There is a soft systolic murmur over the mitral area which is not transmitted.

*Abdomen:* Scaphoid, with definite rigidity in the right rectus more pronounced in the upper half. There is exquisite tenderness over the right upper quadrant in the region of the gall bladder. No definite areas of tenderness in the lower abdomen. Rectal examination, negative; reflexes, active and equal; temperature, 103.2°; pulse, 104; respiration, 22; white-blood count, 10,000; differential band forms, 8; total neutrophils, 90 percent; coagulation time, 4 minutes; icterus index, 50; blood, Kahn negative.

*Operation February 20, 1933.*—Under spinal anesthesia. A small, thick, friable gall bladder containing two stones and no bile was removed. The omentum adherent to the gall bladder was oedematous. The common bile duct was enlarged and a T tube was placed in the common duct. The peritoneal gall bladder bed suture did not entirely control the oozing and a narrow gauze pack was placed in the gall bladder fossa. The distal end of the T tube and the gauze drain were brought out at the upper end of the incision. The abdomen was closed in layers. The operation was completed under spinal anesthesia—no supplementary anesthesia was given.

The day following operation his temperature was 99.8°, pulse 102, respiration 20. He was given carbogen inhalations every 4 hours and 1,000 cc of

5 percent glucose in normal saline b.i.d. His stomach was aspirated by use of Rhexus tube; 300 cc fluid was obtained.

*February 22, 1933.*—The gauze pack was partly removed. The patient received the same treatment as on previous day; 227 cc of dark bile drained from T-tube. His convalescence was uneventful from then on.

*March 14, 1933.*—Icterus index, 20. Stools, dark color. Daily drainage from T-tube about 50 to 150 cc of bile. The bile was lighter in color at this time.

*March 24, 1933.*—Bile now clear. Icterus index, 5. T-tube clamped off.

*March 31, 1933.*—Icterus index, 7, after T-tube was clamped off for a week. T-tube removed. The systolic mitral murmurs can no longer be heard. The pulse, temperature, and respiration were normal.

*April 7, 1933.*—The small sinus where T-tube was removed is now healed. No jaundice.

*April 17, 1933.*—Discharged from hospital. To duty, well.

#### COMMENT

1. A duodenal tube is used to aspirate the stomach for the first two or three days following operation, as these cases are prone to develop acute gastric dilatation.

2. Carbogen inhalations (5 percent CO<sub>2</sub>, 95 percent O) are used for 3 or 4 days post operative as a prophylactic measure to prevent lung complications.

3. Decompression of the liver by the common duct drainage was the most important factor.

4. To drain the common duct without removing the pathological gall bladder that in turn caused the inflammation to spread via the lymphatics to the common duct and produce obstruction to the common duct would not be removing the cause of the disease, and would necessitate another operation.

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#### MEGACOLON, WITH REPORT OF A CASE

By F. L. CONKLIN, Commander, Medical Corps, United States Navy, and W. T. LINEBERRY, Lieutenant Commander, Medical Corps, United States Navy

Hirschsprung established "megacolon" as a definite clinical entity in 1888. Synonyms are "Hirschsprung's disease", "Mya's disease", and "congenital idiopathic dilatation of the colon."

The theories regarding the etiology are numerous and no one of them alone offers a satisfactory explanation. Rankin considers the pathogenesis as mixed. Resected nerves do not show any evidence of defective function, while attempts to show obstruction of the bowel have failed. Of the numerous etiological factors proposed to explain the genesis of megacolon probably one of the most acceptable is that of a neuromuscular dysfunction.

Megacolon has been reported at all ages. Many observers have noted a familial tendency, and in this connection it is interesting

to note that the sister of the case here reported has the same condition.

This case is reported because it does not conform to the classical textbook type, but responded to resection of the sympathetic.

The pathology reported by all textbooks and writings emphasizes dilatation and hypertrophy of the colon. This case showed dilatation without the muscular hypertrophy, yet no obstructive lesion was found by X-ray or at operation.

Medical treatment has been found to be of no avail, and surgical treatment was also extremely unsatisfactory until resection of the sympathetic nerve supply was performed. Various methods exist for resecting the sympathetic nerves.

Judd and Adson resect the second, third, and fourth lumbar sympathetic ganglia, bilaterally, through a transperitoneal approach. Wade and Royall resected the mesially directed branches from the lumbar ganglia, extraperitoneally through a flank incision. The method of Rankin and Learmonth was followed in this case, namely, the inhibitory nerves to the rectum and the motor nerves to the internal sphincter of the anus are treated by resection of the presacral nerve. This nerve is then traced up on the aorta until the inferior mesenteric artery is reached. The nerves along this vessel are then divided. This procedure divides the sympathetic nerves to the portions of bowel mainly involved and does not result in vasomotor disturbance in the lower extremities. The results with respect to the colon appear to be the same as from lumbar sympathectomy and the photographs show in a most striking manner these changes.

*H.A.B.*—Age 33, Veterans' Administration patient, was admitted to the United States Naval Hospital, League Island, Philadelphia, Pa., November 13, 1933.

*Chief complaint.*—Constipation and abdominal distention.

*Present illness.*—Patient states that since 1929 he has had extreme difficulty in moving the bowels, and the abdomen has been markedly distended since 1931. Laxatives and purgatives give no result, and he is compelled to use very large enemata which give only very poor results and have no effect whatsoever on the distention. He has used parathormone in excessive doses with apparent benefit but without effect on the distention. He also has consumed enormous quantities of calcium without any appreciable benefit recently. Now no benefit can be noted from large amounts of both parathormone and calcium:

*Past history.*—Not unusual except as relates to the present condition. He was in excellent health during infancy and early childhood. Measles at the age of 11, and typhoid fever at 15. His mother confirmed his statement that he did not suffer from constipation in early life. He first noticed constipation in 1917, he then being 18 years of age. Satisfactory defecation accomplished by taking laxatives and cathartics. In 1922 he had malaria, and following this his constipation grew much worse. In spite of large amounts of cathartics, he had a bowel movement only once or twice a week.



FIGURE 1.—SHOWS THE ENORMOUSLY DISTENDED COLON PRIOR TO OPERATION.  
Note the absence of haustrations and the reduplication of the bowel on the right side of plate.





In 1926 he was first admitted to the United States Naval Hospital, Philadelphia, Pa., and at that time dilatation of the colon was noted by roentgen-ray study. He has had five subsequent admissions—one in 1928 for the same condition accompanied by nervous symptoms; again in May 1929 with similar complaints. He was again admitted in October of the same year with a hernia and the same complaint of constipation. In 1931 he again was a patient in the hospital with unimproved constipation. Roentgen rays showed the huge colon. Palliative treatment was by enemata and other measures for relief of constipation. At this time the parathormone and calcium treatment was instituted, and for quite a time appeared to be of considerable benefit in obtaining bowel movements, but the dilatation of the colon was not changed in any respect. By June 1932 no results could be obtained from parathormone, and the abdominal distention grew more troublesome. On September 20, 1932, the patient was given a spinal anesthesia and the distention disappeared within a half hour's time but recurred when the anesthesia wore off.

*Family history.*—Irrelevant except that he has one sister who has within the past year been diagnosed as megacolon.

On November 13, 1932, he was again admitted to the hospital. Physical examination was essentially negative except for an enormously distended abdomen. Patient given regular diet, colonic lavage BID and retention-enemata TID of tincture of belladonna MX.

*November 16, 1932.*—Some relief is experienced if he does not eat.

*November 18, 1932.*—To the operating room. No preoperative morphine administered. Under spinal anesthesia the abdomen was opened by a left paramedian incision. The intestines were packed off upward and to the right, the sigmoid colon was drawn to the left and downward. The posterior abdominal peritoneum was incised longitudinally, the incision extending  $2\frac{1}{2}$  inches above and the same distance below the bifurcation of the abdominal aorta. The larger sympathetic trunk was just mesial to the left iliac artery and the smaller trunk in a corresponding position on the right. Both trunks were severed and ligated 2 inches below the aortic bifurcation. With traction on these two filaments and by blunt dissection the plexus was removed up to and around the inferior mesenteric artery. Just below the mesenteric artery there was a large ganglia. A filament of the right trunk at the bifurcation of the aorta extended over to the vena cava. Several small branches arising from the main left trunk were excised from around the inferior mesenteric artery. The posterior peritoneum was closed. The colon was distended throughout, but did not show the textbook type of hyperplasia. It appeared thinner than normal. No distention during the day.

*November 19, 1932.*—Patient required catheterization. Required morphine sulphate gr  $\frac{1}{4}$  (H) during the night. No distention.

*November 20, 1932.*—Allowed liquid diet. Placed on mineral oil. Gas passed freely. Abdomen flat.

*November 22, 1932.*—Allowed soft diet. No distention.

*November 23, 1932.*—Patient had a fair bowel movement.

*November 25, 1932.*—Fair bowel movement. Sutures removed. Incision well healed.

*November 27, 1932.*—Slight distention. Good bowel movement.

*November 29, 1932.*—Increased distention present.

*December 5, 1932.*—Distention continues annoying. Bowels constipated.

*December 9, 1932.*—Bowels move fairly well but the distention appears the same as prior to operation.

*December 12, 1932.*—To satisfy the desires of patient, parathormone treatment allowed.

*January 4, 1933.*—No marked change. Distention is present most of the time.

*January 14, 1933.*—Patient noted that the distention disappears as soon as hypodermic of parathormone is given.

*January 20, 1933.*—Barium enema and X-ray made with the following report:

"The column of barium enters the rectum, filling it, then enters the sigmoid flexure where it forms an extra loop of about 4 inches. The diameter of this loop is rather large. It rises up to the splenic flexure, then by the transverse colon over to the hepatic flexure, then down to the cecum. The diameter of this part of the gut is practically normal except the distal end of the transverse colon where there is a slight increase in size. The haustrations are fairly normal. This study shows a marked decrease in the size of the gut and difference in its course when compared with the one made previously."

*January 21, 1933.*—Following the report of such marked improvement as shown by the barium enema and the patient's statement that the distention leaves immediately upon taking parathormone hypodermically, the performance was witnessed. Close inspection shows that as soon as a few drops of the drug are injected the abdominal distention drops and the somewhat hollow-chested appearance improves. The chest swells as if he had taken a deep breath. It is believed at this time that the apparent "distention" of the abdomen is due to a psychoneurotic element.

*January 22, 1933.*—Distilled water tinted the same as parathormone administered with the same "beneficial" results as parathormone.

*January 24, 1933.*—Patient failed to obtain any result from parathormone as he thought he was being "fooled" and not getting his regular drug.

*January 26, 1933.*—All parathormone vials in the ward emptied of the drug and filled with sterile water. Regular injections of sterile water continued with "beneficial" results. If patient does not take this before meals he "distends", and after he "distends" the hypodermic will completely relieve the distention.

*February 1, 1933.*—Barium enema study made with the following report:

"The present study was done without a previous injection of parathormone. There is a fairly well-marked change in the size of the rectum. The present study shows it to be smaller, the loop described in the previous film as rising from the tip of the rectum and being about 4 inches long has been eliminated and the descending colon comes down the normal course to the left side of the wall, making a very slight loop just below the splenic flexure. The gut is more normal in size than in previous films and the haustrations are more clearly seen."

In view of the marked improvement indicated by this report, the patient was informed that he did not require any further medication as he had been doing well for over a week on hypodermics of sterile water.

*February 3, 1933.*—Patient having difficulty in realizing his situation. He states that he again "distends" when he eats. Given a sterile hypodermic, knowing it to be such, the distention disappeared immediately. Full explanation made regarding drugs now being unnecessary.

*February 10, 1933.*—Patient has now been free of any distention and the bowels have moved daily for 8 days. He is now convinced that he is cured.

*February 20, 1933.*—Patient has remained entirely normal and has normal daily bowel movement.

*March 1, 1933.*—Discharged from the hospital extremely happy and feeling normal in all respects.



FIGURE 2.—SHOWS THE BOWEL 4 HOURS AFTER BARIUM ENEMA ON 2-1-33.



*April 18, 1933.*—Follow-up shows patient still free from constipation and distention.

#### CONCLUSIONS

1. In sympathetic resection for megacolon, when the dilatation has occurred by thinning, quite a period of time is required for the bowel to resume its normal size.
2. On account of the duration of this disease, affected patients are quite neurotic and it is easy to have a definite secondary psychoneurosis in addition to the real pathology. Such neurosis requires very careful management.
3. Parathormone was of no benefit in this case other than its psychic influence as it did not diminish the size of the bowel.

#### BIBLIOGRAPHY

- Wade, R. B., and Royle, N. D.: Operative treatment of Hirschsprung's disease; a new method. *Med. Jour. Australia*, 1: 137-141 (Jan. 29, 1927).
- Popper, J.: Congenital megacolon (Hirschsprung's disease). *New York Med. Jour.*, 112: 1030-1031 (Dec. 25), 1920.
- Wade, R. B.: Left lumbar ramisection in Hirschsprung's disease. *Lancet*, 1: 136-137 (Jan. 18), 1930.
- Rankin, F. W.: The Colon, rectum and anus, 1933, Saunders, pages 83-104 and 798-803.
- Rankin, F. W.: Malformations of the Colon; Dean Lewis, Practice of Surgery. W. F. Prior Co., Inc., 7: 31.
- Learmonth, J. R., and Markowitz, J.: Studies on innervations of the large bowel. *Am. Jour. Physiol.*, 94: 501-504 (September) 1930.
- Rankin, F. W., and Learmonth, J. R.: Section of the sympathetic nerve of the distal part of the colon and rectum in treatment of Hirschsprung's Disease and certain types of constipation. *Ann. Surg.*, 92: 710-719 (October) 1930.
- Judd, E. S., and Adson, A. W.: Lumbar sympathetic ganglionectomy and ramisection for congenital idiopathic dilatation of the colon. *Ann. Surg.*, 88: 479-298 (September) 1928.
- Adson, A. W.: Sympathetic resection. *Ann. Int. Med.* vols. 6-8, pp. 1044 to 1066.

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#### EMBRYONIC CARCINOMA OF TESTICLE WITH MULTIPLE METASTASIS

By C. M. HUGHES, Lieutenant (junior grade), Medical Corps, United States Navy

Tumors of the testicle comprise from one half to 1 percent of all tumors; are practically always unilateral; and are rare below the age of 18 and over 50 years. Of the varieties of teratoma testis, the embryonal malignant tumors is the largest and most important group. They are soft, opaque, often necrotic, rapidly growing tumors arising in the rete. Extensions to vas, seminal vesicle, or ejaculatory ducts are never seen, though the cord may be infiltrated by intralymphatic growth.

We may feel fairly sure that early metastasis has occurred; and since it is by the blood stream, it is probably generalized, and gives

rise to tumors of lungs, liver, brain, kidney, and stomach. The retroperitoneal nodes at the celiac axis are often involved through the lymph channels of the spermatic veins, and an epigastric tumor is often the first sign of the condition. Malignant tumors of the epididymis and spermatic cord are so rare as to be practically nonexistent.

The symptomatology is practically limited, in the early stages, to the local enlargement, which is usually painless. Loss of weight is a fairly common symptom. The course of the disease is progressive, and usually rapidly so. Sometimes there may be periods of remission in which little, if any, growth seems to occur.

Diagnosis depends principally upon local palpation. In the typical case the testis is symmetrically enlarged, so that in general terms the scrotal tumefaction is smooth and ovoid. There is usually some slight redness. The epididymis may usually be felt, and it affords the most valuable aid to diagnosis, as once it is outlined, one may be sure that the enlargement involves the testis proper. The tumor has a heavy, solid feel, and the skin moves freely over it.

The principal lesions which may give rise to confusion are syphilis, hydrocele, hematocele, spermatocele, and tuberculosis. If the Kahn is negative, syphilis is probably not present. If the Kahn is positive, tumor is not at all excluded. If doubt remains, the removal of a gummatous testis can do no harm. Hydrocele is often present with the tumor, so makes the transmission of light of little importance. In very doubtful cases it may be permissible to tap the hydrocele in order to palpate the testis. Hematocele is much rarer than testicular tumor, and exploration alone makes the diagnosis certain. Spermatocele is usually small enough so that the testis can be palpated separately. In tuberculosis, usually the irregular nodular character of the growth is most marked in the epididymis.

Since practically all tumors of the testis are malignant, according to Young, radical operation should be done whenever possible and as early as possible. Keyes states that a combination of radiation and operation does much better.

The following case is reported because of its unusual complication of dysphagia, which was caused by a metastatic tumor to the cardia of the stomach invading the esophagus, thus producing a stenosis.

*O.A.S.*—Age 38, admitted to the United States Naval Hospital, Mare Island, Calif., on December 12, 1932, complaining of difficulty in swallowing, severe burning pain in chest after eating, regurgitation of food, recent loss of weight, marked weakness, and an enlarged right testicle.

*Present illness.*—About 3 weeks prior to admission he noticed some enlargement of the right testicle, which first started at the upper pole, and was accompanied by an occasional burning pain. A few days later he thought it became smaller, but it again enlarged and involved the entire right testicle. About 2 weeks prior to admission he started having noticeable difficulty in

swallowing, and a burning pain beneath the sternum after swallowing food. This progressed rapidly, so that a week later food regurgitated almost immediately after swallowing. If he ate very small quantities slowly, regurgitation did not occur. Fluids regurgitated as well as solid food. Warm fluids were swallowed somewhat easier than cold. Upon admittance he complained of a severe burning pain just at the left of the sternum after swallowing food, which radiated to the region of the heart and then back to beneath the left shoulder blade. His weight a month before admission was 167 pounds, and on admission was 145 pounds, a loss of 22 pounds.

*History of systems.*—Otherwise essentially negative except for: Gastrointestinal: Hungry all the time. There was no nausea associated with regurgitation of food, and there was only a slight dull upper abdominal distress associated with the substernal pain. Constipated past month. No tarry or bloody stools noted.

*Past history.*—Essentially negative. Denied any venereal infection.

*Family history.*—Essentially negative.

*Physical examination.*—Revealed an emaciated white male apparently acutely ill. Temperature, 97° F.; pulse, 88; respiration, 18; blood pressure, 100/75. The only positive findings were—Genitalia: The right testicle was enlarged to about twice the size of the left, and was very firm, as well as the epididymis, which felt to be also enlarged. The cord was very hard and palpable along its entire course. There was very little tenderness. Bilateral very small shotty glands in the groins.

He was observed while eating; and after swallowing some meat and potatoes, he complained of severe pain beneath the lower end of the sternum, followed in a minute or two by regurgitation of the food. After slowly swallowing a little milk, it was also regurgitated.

*Laboratory findings.*—Urinalysis, negative. Red-blood count, 4,900,000; hemoglobin, 90 percent; leucocytes, 13,000; neutrophils, 68 percent; lymphocytes, 28 percent; polymorphs, 62 percent; band forms, 4 percent; young forms, 2 percent; basophiles, 2 percent. Kahn, negative.

*Clinical impressions:*

1. Highly malignant tumor of right testicle.
2. Possible metastatic mediastinal tumor causing external pressure on esophagus.
3. Carcinoma of esophagus.
4. Cardiospasm.

*Clinical course.*—Fluoroscopic examination with barium revealed marked spasm of esophagus with no release of barium after 15 minutes.

*X-ray.*—Examination of the chest showed no pathological involvement of lungs or mediastinum.

Patient given frequent small feedings. Surgical removal of testicular tumor withheld due to development of chest pains and elevation of temperature. X-ray of chest still negative. As patient was losing weight and strength a Behruss tube was passed and left in position. Frequent feedings of egg-nog and cream administered, and after 3 days patient was able to swallow, seemingly without difficulty, so tube was removed. A few days later patient complained of severe substernal pain, and he coughed up considerable foul, purulent sputum. Temperature elevated to 103.4° F., and ran a septic course. A lung abscess was suspected connected with esophagus. Methylene blue given orally was coughed up. X-ray of chest (Jan. 6, 1933) showed marked increased density of descending root branches on right side, but no evidence of abscess. Patient died on January 8, 1933, 27 days after admittance, and about 7 weeks after tumor of testicle was first noticed.

## AUTOPSY REPORT

Body is that of an emaciated white man about 40 years of age. Body is cold. Rigor mortis present. Body opened by midline incision. All serious cavities are free from excess fluid. The pericardium is smooth with a few violin string adhesions to the right lung. The heart and aorta show no pathology. There is a small abscess in the lower part of the mediastinum that communicates with the esophagus and with the lower lobe of the right lung. The right lung, in addition to the abscess just mentioned, shows pneumonia of the lower and middle lobes. Scattered throughout all lobes are numerous white tumor nodules. The left lung also shows pneumonia and congestion in the lower lobe.

*Abdomen.*—The stomach is small, shrunken, and hard. It is attached to the left lobe of the liver by dense white adhesions. When the organ is opened it is seen that the cardia and the first inch or so of the esophagus above the cardia are involved in a tumor mass. There is a small perforation of the esophagus about an inch above the cardiac orifice. This communicates with the mediastinal abscess. There are numerous tumor nodules scattered throughout the mesentery and great omentum. Liver and gall bladder negative. Spleen and pancreas, no pathology apparent. Kidneys, negative.

There is a small dense white mass of tissue in the mediastinum of the right testicle measuring 1.5 cm in diameter.

*Histopathological examination—Testicle.*—The mass is composed for the most part of fibrous tissue with malignant cells in small groups and large masses scattered throughout. These cells are large, more or less round, and with vesicular hyperchromatic nuclei. This tumor apparently has undergone some regression. In some of the sections considerable lymphoid tissue is present.

*Stomach.*—Most of the normal markings have been obliterated by tumor cells that resemble those seen in the testicle. Remnants of the gastric mucosa are still intact in which normal glandular structure is visible. All layers of the stomach wall are being invaded by tumor cells. There is considerable evidence of inflammatory reaction.

*Esophagus.*—Normal appearing squamous epithelium lines the lumen. Present in all the other layers are the tumor cells that resemble those found in the testicle and stomach.

*Lung.*—Sections made from the nodules in the lungs show the same type of cell as is present in the other tumor areas.

## PATHOLOGICAL DIAGNOSIS

1. Embryonic carcinoma of testicle, right.
2. Metastatic embryonal carcinoma in stomach with extension into the esophagus.
3. Metastatic embryonal carcinoma in lungs.
4. Mediastinal abscess due to perforation of the esophagus.
5. Bronchopneumonia, both lower lobes.

## BIBLIOGRAPHY

- Boyd, W.: Surgical Pathology.  
Ewing, J.: Neoplastic Diseases.  
Keyes, E. L.: Urology.  
MacCallum, W. G.: Textbook of Pathology.  
Young, H. H., and Davis, D. M.: Young's Practice of Urology, V.I-671.



# NAVAL RESERVE

## MEDICAL CORPS

### APPOINTMENTS, THIRD QUARTER, 1933

Name	Rank	Appointed
Braceland, Frank J.....	Lieutenant (junior grade), MC-V (G).....	Aug. 25, 1933
Peinse, Samuel.....	Lieutenant (junior grade), MC-V (G).....	Do.
Bunch, Charles.....	Lieutenant (junior grade), MC-V (G).....	Aug. 14, 1933
Gernand, Henry C.....	Lieutenant (junior grade), MC-V (G).....	Sept. 8, 1933
Pepper, Milton.....	Lieutenant (junior grade), MC-V (S).....	Aug. 14, 1933

### PROMOTIONS

Name	From—	To—
Leland, Thomas B. W.....	Commander, MC-V (G).....	Captain, MC-V (G).
Thompson, Ferris W.....	Lieutenant (junior grade), MC-V (G).....	Lieutenant, MC-V (G).
Heimkamp, George F.....	Lieutenant (junior grade), MC-V (G).....	Lieutenant, MC-V (G).
Hungate, Carroll P.....	Lieutenant (junior grade), MC-V (G).....	Lieutenant, MC-V (G).
Warfield, Chester H.....	Lieutenant (junior grade), MC-V (S).....	Lieutenant, MC-V (S).
Rutledge, Richard M.....	Lieutenant (junior grade), MC-F.....	Lieutenant, MC-F.
Larson, Lawrence M.....	Lieutenant (junior grade), MC-V (G).....	Lieutenant, MC-V (G).

## DENTAL CORPS

### APPOINTMENTS

Name	From—	Appointed
Ennis, LeRoy M.....	Lieutenant Commander, DC-V (S).....	July 27, 1933
Schnell, Paul A.....	Lieutenant (junior grade), DC-V (G).....	Sept. 5, 1933

### PROMOTIONS

Name	From—	To—
Gelhaar, Harold R.....	Lieutenant (junior grade), DC-V (G).....	Lieutenant, DC-V (G).
Goldenberg, Alexander M.....	Lieutenant (junior grade), DC-V (G).....	Lieutenant, DC-V (G).
Schwalbe, Gordon W.....	Lieutenant (junior grade), DC-V (G).....	Lieutenant, DC-V (G).
Wald, Samuel S.....	Lieutenant (junior grade), DC-V (G).....	Lieutenant, DC-V (G).



## **NOTES AND COMMENTS**

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### **COMMUNICABLE DISEASES**

At this season of the year when the incidence of the acute diseases of the respiratory tract and the acute exanthemata is usually high, the Preventive Medicine Section has provided a summary of the regulations for the control of communicable diseases in use by the United States Public Health Service, which is published in the Preventive Medicine Section of this number. It is believed that this summary will be helpful to busy medical officers who are engaged in instituting preventive measures against the spread of these diseases, particularly those usually prevalent at this time in northern latitudes, and that it will furnish at all times a reference manual for the important communicable diseases.

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### **MEDICAL OFFICERS RECOMMENDED FOR FELLOWSHIP IN THE AMERICAN COLLEGE OF SURGEONS**

The Surgeon General has recommended the following medical officers of the Navy for fellowship in the American College of Surgeons:

Lt. Comdr. William S. Bunkley (M.C.), United States Navy.  
Lt. Comdr. George G. Herman (M.C.), United States Navy.  
Lt. Comdr. Henry D. Hubbard (M.C.), United States Navy.  
Lt. Comdr. Maurice S. Mathis (M.C.), United States Navy.  
Lt. Comdr. John E. Porter (M.C.), United States Navy.  
Lt. Gilbert E. Gayler (M.C.), United States Navy.  
Lt. Franklin V. Sunderland (M.C.), United States Navy.  
Lt. Clifford H. Swanson (M.C.), United States Navy.  
Lt. Comdr. Otto W. Grisier (M.C.), United States Navy.

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### **MEDICAL OFFICERS SELECTED TO RECEIVE COMMENDATORY LETTERS FROM THE SURGEON GENERAL FOR ARTICLES PUBLISHED IN THE BULLETIN IN 1933**

Each year it has been the practice for a special board to select from the articles and reports published in the **NAVAL MEDICAL BULLETIN** during the calendar year five or six contributions which are

considered to be of particular merit. Each author of such an article or report is then informed of this selection, in an official letter from the Surgeon General, commending his professional interest.

The postgraduate board which, this year, exercised the function of making the selection, recommended that the following receive letters of commendation from the Surgeon General for the articles which appear here after their names:

Lt. (Jr. Gr.) C. W. Shilling, Medical Corps, United States Navy: Expiratory Force as Related to Submarine Escape Training.

Capt. K. C. Melhorn, Medical Corps, United States Navy: The Trend in Anaesthesia and its Relation to Medical Department Personnel Requirements.

Lt. Comdr. H. R. Delaney, Dental Corps, United States Navy: The Pulpless Tooth.

Capt. E. W. Brown, Medical Corps, United States Navy: Carboxide Gas: A New Insecticidal Fumigant.

Capt. Lucius W. Johnson and Lt. (Jr. Gr.) T. G. Hays, Medical Corps, United States Navy: Severe Head Injuries.

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#### ANNUAL REPORT OF THE SURGEON GENERAL, UNITED STATES NAVY

This year the Annual Report of the Surgeon General, covering the general activities of the Medical Department of the Navy, has been added as an appendix to the Annual Report of the Secretary of the Navy. The statistical tables and other data in connection with them are published as a separate pamphlet under the title Statistics of Diseases and Injuries in the United States Navy for the Calendar Year 1932.

The preliminary letter, included in the appendix to the Secretary of the Navy's Report, is here reproduced as in it are contained mention of the most important features regarding the health of the Navy and the activities of the Medical Department.

Subject: Annual Report for Fiscal Year 1933.

To: The Secretary of the Navy.

This report covers the activities of the Medical Department of the Navy during the fiscal year ending June 30, 1933, and gives the statistics dealing with the health of the Navy for the calendar year ending December 31, 1932.

The health of the Navy for the calendar year 1932 shows improvement as compared with 1931. This is due mainly to decreases in gastro-intestinal diseases, certain communicable diseases transmissible by oral and nasal discharges, diseases transmissible by insects and other arthropods, venereal diseases, other diseases of infective type, and injuries. An increase in catarrhal fever, caused by an outbreak in the Battle Force, was more than offset by decreases in influenza, dengue, and cellulitis. While there was a decrease in the incidence of influenza in the Navy as a whole, a moderately severe epidemic of that disease occurred in the forces afloat in July 1932 and as-

sumed such proportions that for 2 weeks the movements of ships, gunnery exercises, and other fleet activities were affected. Fortunately, the disease was of a relatively mild character and there were but few deaths. The decrease in communicable diseases is largely due to restricted recruiting. The decrease in the number of injuries may be partly ascribed to additional interest in the subject of safety precautions. The admission rate for all diseases and injuries was 554.06 per 1,000 for the year 1932.

There were 371 deaths from all causes in 1932, giving a rate of 3.35 per 1,000. This is slightly lower than the expected rate, 3.47 being the median rate for the preceding 5-year period. Seventy deaths were caused by motor-vehicle accidents. This group of accidents continued to occupy first place as a cause of accidental death in the Navy in 1932, as it also did in 1931 and 1930. Prior to 1930, drowning was the principal cause of accidental death in the Navy. Deaths from drowning in 1932 numbered 34.

During the year, the Naval hospital at Great Lakes, Ill., was closed as the result of an order discontinuing the use of naval training station at that place. On February 6, 1933, a contract was signed for the construction of a new hospital at Philadelphia, Pa., and work was begun on February 14.

The loss of the airship *Akron* on April 4, 1933, was a disaster that resulted in the death of 16 officers, 1 warrant officer, and 55 enlisted men of the United States Navy. As the statistical data are for the calendar year 1932 these figures are not included in the computation of the annual death rate.

During the earthquake at Long Beach, Calif., the Navy took an active part in the relief work in which approximately 50 medical officers and 250 hospital corpsmen were engaged.

The Medical Department of the Navy at the close of the fiscal year consisted of 891 medical officers, 192 dental officers, 140 warrant officers, 466 nurses, and 3,794 hospital corpsmen. There were 508 medical officers and 188 dental officers in the United States Naval Reserve.

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#### MONTHLY MEDICAL MEETINGS AT THE UNITED STATES NAVAL MEDICAL SCHOOL

The following notice sent out to medical officers who are on duty in Washington or vicinity is of interest, not only because it emphasizes the purpose of all meetings of medical societies as "both social and professional" but because it furnishes an outline and plan for such meetings which can be used particularly in the larger naval hospitals to further cordial professional and social relations between naval medical officers and members of the civil profession to the mutual benefit of both.

Subject: Monthly meetings of officers of the Medical Department of the Navy in the District of Columbia.

To: All officers of the Medical Department in the District of Columbia and vicinity.

1. A series of monthly meetings of officers of the Medical Department of the Navy residing in or near the District of Columbia is hereby initiated under the auspices of the Bureau of Medicine and Surgery to begin this fall and carry through to the spring of 1934. The aims entertained in this undertaking are both social and professional, and it is expected that the projected meetings

will be productive of closer fraternal and social relations between officers, and of distinct professional benefit.

2. The meetings will begin promptly at 8 o'clock in the evening, at the Naval Medical School, corner of Twenty-third and E Streets NW., on the first Monday of each month from October to May inclusive. The school and Naval Hospital will combine as host on these occasions. The programs for the meetings will be similar in character, consisting of the presentation of a subject of medical, medico-military, or scientific interest, followed by opportunity for discussion, and a social hour during which light refreshments will be served. The whole program in its several parts should not take more than an hour and three quarters or 2 hours at most, and the results in information to be acquired, and in fellowship to be realized for our individual and collective good, should justify regular attendance.

All commissioned officers (active, reserve, and retired) of the Medical Department of the Navy, residing or visiting in Washington and vicinity, are cordially invited to attend, but it is particularly desired that the active officers of the Medical Department of the Regular Navy take advantage of these opportunities to foregather. Official duties and circumstances of service may prevent, but social engagements conflicting with these meetings should be avoided.

3. Owing to the limited capacity of the school's lecture hall, it is unfortunately impossible to extend a general invitation to officers of other Government services, but representatives of other Government medical departments and the civilian profession will be specially invited from time to time.

4. A tentative schedule of programs for the eight meetings will be announced at a later date and timely notices of any change will be sent out from this office. It is sufficient to advise at this time that at the first meeting, the evening of October 2, Rear Admiral P. S. Rossiter, the Surgeon General, United States Navy, will talk on Important Current Activities of the Medical Department.

O. J. MINK,  
*Acting Chief of Bureau.*

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Dr. Earl Baldwin McKinley, dean and professor of bacteriology of the medical school of the George Washington University, was the special guest speaker of the first evening. The subject of his address was Epidemic Encephalitis.

The tentative professional programs of special guest speakers for the other seven projected monthly meetings are as follows:

Monday, November 6, 1933. Dr. Victor G. Heiser of the Rockefeller Foundation, New York. Subject: Medical Observations During the Past Year in Many Lands.

Monday, December 4, 1933. Dr. Lewis H. Clerf, professor of bronchoscopy, Jefferson Medical College, Philadelphia, Pa. Subject: Atelectasis—A discussion of its Mechanism, Etiology, Clinical Aspects, and Treatment.

Monday, January 8, 1934. Dr. Maurice C. Pincoffs, professor of medicine, school of medicine, University of Maryland, and College of Physicians and Surgeons. Subject: Respiratory Embarrassments.

Monday, February 5, 1934. Dr. Robert H. Ivy, professor of maxillo-facial surgery, school of medicine, University of Pennsylvania. Subject: Plastic Surgery.

Monday, March 5, 1934. Dr. Ales Hrdlicka, curator in charge of physical anthropology, United States National Museum. Subject: Anatomy of the Future.

Monday, April 2, 1934. Medical Director George W. McCoy, United States Public Health Service, director of the National Institute of Health, Washington, D.C. Subject: Biologicals.

Monday, May 7, 1934, Maj. Gen. Harry L. Gilchrist, United States Army, Chief of Chemical Warfare Service. Subject: Common Misconceptions Concerning Chemical Warfare.

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#### THE POST-GRADUATE BOARD

The post-graduate board has the important function of appraising each year the specialist requirements of the Navy and selecting and training officers who desire to enter the various specialties. The list below is arranged in order of the greatest need at present:

Clinical laboratory and pathology

X-ray

Neuropsychiatry

Submarine duties

Surgery

Obstetrics and gynecology

Internal medicine

Eye, ear, nose, and throat

The board also has been assigned two other tasks of interest and importance, that of selecting the authors of articles of special merit published during the calendar year in the Naval Medical Bulletin, and that of selecting the candidates for Fellowship in the American College of Surgeons.

The post-graduate board at present is constituted as follows: Capt. W. H. Bell (M.C.), United States Navy, president; Capt. Reynolds Hayden (M.C.), United States Navy; Capt. R. W. McDowell (M.C.), United States Navy; Commander Luther Sheldon (M.C.), United States Navy; Commander Harry E. Harvey (D.C.), United States Navy, members; and Commander Louis H. Roddis (M.C.), United States Navy, member and recorder.

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#### RESEARCH REGARDING DETERIORATION OF DRUG CONTAINERS, LABELS, AND PACKAGE COVERINGS

One of the principal problems with which pharmacists and pharmaceutical manufacturers are faced is the deterioration of drugs, both crude and manufactured. Research in this subject and the methods to prevent deterioration is going on in all parts of the world. There has also been a need for research in the deterioration

of containers of drugs, bottles, corks, labels, and package coverings of drugs and medical and surgical supplies.

Lt. Comdr. L. D. Arbuckle (M.C.), United States Navy, at Edgewood Arsenal, has made a study of this latter subject and arrived at some conclusions of interest.

Bottle closures of various sorts were experimented with, using such standard drugs as tincture of iodine, acetic acid, castor oil, ethyl alcohol, and aromatic spirits of ammonia in plain glass bottles. As a result of his study, he recommended that the Bakelite screw top be used for all except strong acids, which should be supplied with ground-glass tops.

It was recommended that labels be attached with a good grade of commercial mucilage with which has been incorporated 10 percent of sodium orthophenylphenate. The outside of the label is to be protected with sandarac alcohol varnish.

No definite results were reached in the study of the coverings of the supplies. Wax paper loosens and cracks. Cellophane is useful, but at present is too fragile. Manufacturers are at present working on the problem of making it stronger.

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#### PREVENTION AND TREATMENT OF HEAT EXHAUSTION

Medical officers who served afloat in coal burning ships will be interested in recent investigations of this subject which apparently explains the pathogenesis of this condition and points the way to appropriate measures in prevention and treatment. The two investigators—Talbot and Michelson—whose work is abstracted in the *Journal of the American Medical Association*, took samples of venous blood from patients immediately after entering the hospital suffering from heat cramps.

Both chemical analysis and morphologic examination of the blood were carried out and certain analyses of the urine also were made. The most striking change in the composition of the blood during heat cramp is a diminution in both the total base and the acid ions; the change is more pronounced in the latter and is accounted for largely by the drop in content of chloride. There is also a concomitant loss of water from the circulation. Treatment consisted of physiologic solution of sodium chloride either subcutaneously or intravenously and milk in quantity as the only food. After the salt and liquid had been given, both the total base and the acid ions approached the normal level of concentration in the blood; at the same time the urinalysis showed a retention of sodium chloride and of water for several days. These observations indicate that the profuse sweating incident to vigorous exertion in extreme heat results in a loss of water and sodium chloride through the skin severe enough to be reflected in the acid-base and water balance of the body.

The pathogenesis of heat cramps thus appears to be defined rather succinctly by these recent chemical studies. The loss of salt and water and the replacement of fluid alone through intake of water diminish the osmotic pres-



sure of the interstitial fluid. The tissues tend to lose chloride in an attempt at adjustment to the hypotonic surrounding medium, and at some level characteristic of the individual there occur the neuromuscular disturbances typical of heat cramps. Other suggestions have been made to explain the origin of this syndrome. Thus it was at various times said to result from acute muscular degeneration, from water poisoning, and from temporary cessation of kidney function. However, it appears that the evidence based on studies of the water and salt balance before treatment and the resulting chemical changes provide a more tenable theory for the etiology of heat cramps. Supporting evidence is afforded in the records of prevention of this disturbance through the free use of milk and of saline drinks of various kinds. No doubt practical preventive therapy will be developed for the occupations concerned when the data on the critical level of base and chloride in the blood, the approximate extent of sweating, and the salt in the food are equated on the basis of clinical statistical experience.

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#### **HOSPITAL CORPS MEN GIVEN THE SAME RATING AS MALE NURSES FROM ACCREDITED NURSING SCHOOLS IN CIVILIAN HOSPITALS**

The Director of the American Male Nurses' Association in a recent letter to the Surgeon General of the Navy, states that they have placed Hospital Corps men from the United States Navy on the same footing as other male nurses from accredited training schools for male nurses. The following extracts from the letter are quoted:

You will be interested to know that we have listed the Hospital Corps men of the United States Navy, with certificate of nursing training and honorable discharge, in our list of accredited training schools for male nurses—we grade your Hospital Corps men as our male nurses from recognized training schools for male nurses—list of Journal of American Medical Association, March 1927, and we have added also St. Vincent's Hospital, New York, recently organized and recognized. This listing will appear in the next issue of the Directory of the American Medical Association.

We feel that the United States Government, through the Bureau of Medicine and Surgery, and the interest of its medical personnel, has gone to great expense and care in the proper training of its Hospital Corps men, and that these men reach a high standard; that the Hospital Corps men of the United States Navy should be recognized officially in civilian life as "graduate male nurse in effect"; and for that reason have given them official status in our organization. We recommend them after honorable discharge for equal employment with graduate male nurses.

It is suggested that medical officers give this matter publicity among members of the Hospital Corps.

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#### **QUESTIONS GIVEN BY THE NATIONAL BOARD OF MEDICAL EXAMINERS IN SEPTEMBER 1933**

The following questions, given during the recent examination by the National Board of Medical Examiners, are published for the

convenience of medical officers who desire to appraise the scope and character of the examination with an idea of appearing before the National Board at some later period. Furthermore, such questions are a helpful guide to the studious officer who wishes to review a subject for his own satisfaction or in preparation for an examination for promotion.

#### ANATOMY

*Answer any five questions*

1. Contrast completely the effects which result when the right facial nerve is cut in the facial canal of the temporal bone, with those which result from a cut of the entire left trigeminal nerve at the Gasserian ganglion.
2. Discuss the growth and developmental changes which account for the anatomical courses of the recurrent laryngeal nerve and the phrenic nerve.
3. On the basis of anatomical arrangements, discuss what might be the injuries involved in dislocation of the shoulder-joint.
4. Name all the arteries which must be tied in order to completely deprive the pancreas of blood, and describe the venous drainage of the pancreas.
5. Discuss in general the static and dynamic supports of the pelvic viscera, especially describing the attachments of the fascia involved.
6. Describe: (a) The gross structures involved in the flow of blood into and through the right and left chambers of the heart; (b) the structure of those parts of the heart which are concerned with the coordinating mechanism.
7. What is the most characteristic histologic feature of (a) the thyroid gland; (b) the ovary, (c) the pancreas, (d) the stomach wall, (e) the parotid gland, (f) the heart muscle?

#### PHYSIOLOGY

*Answer any five questions*

1. Explain the "after action" of tendon reflexes.
2. Describe the mechanism of salivary secretion induced by eating.
3. Explain fully the causes and consequences of the "oxygen debt" following severe muscular exercise.
4. Discuss the mechanisms by which changes in arterial pressure automatically regulate arterial pressure.
5. Outline the evidence that the adrenal cortex produces a physiologically essential hormone.
6. Describe the characteristic effects of stimulation of efferent sympathetic nerves.
7. Discuss the light sensitivity of different parts of the retina.

#### BIOCHEMISTRY

*Answer any five questions*

1. Write structural formulae for two of the following: Uric acid, creatinine, acetoacetic acid, stearic acid, fructose.
2. Discuss the factors which influence the utilization of calcium.
3. Enumerate the possible changes which, as far as is known, lactose may undergo from ingestion to ultimate utilization.

4. Describe briefly qualitative tests for two of the following: Tyrosine, tryptophane, lactic acid, cholesterol.
5. How does digestion influence the requirement of sodium chloride by the body?
6. Discuss: (a) Metabolism in fasting; (b) desaturation of fats; (c) keratin.
7. Define: (a) Specific dynamic action; (b) amylase.

### **PATHOLOGY**

#### *Answer any five questions*

1. Indicate the modes of development of pulmonary atelectasis and describe the microscopic appearance of the lung in this condition.
2. Contrast the gross and microscopic appearance of the spleen in (a) chronic passive hyperemia, and (b) amyloidosis.
3. Discuss briefly the reputed increase in incidence of carcinoma.
4. Discuss briefly the relations of pulmonary and intestinal tuberculosis.
5. What is meant by the term exudate? What types of exudate may occur in and upon serous membranes?
6. Give in a few words your conception of the nature of the following: (a) Chloroma; (b) splenomegaly; (c) polycythemia vera; (d) metastatic calcification; (e) tabes dorsalis; (f) Hutchinson's teeth; (g) tetany; (h) xanthoma; (i) toxin; (j) trichinosis.

### **BACTERIOLOGY AND IMMUNOLOGY**

#### *Answer any five questions*

1. Discuss the bacteriology of lobar pneumonia.
2. Describe the life history of *Wuchereria (Filaria) bancrofti*.
3. Outline the laboratory diagnosis of diphtheria.
4. What reactions in man may follow the first and a subsequent injection of horse serum?
5. Name a bacterial disease of man in which the horse is the usual source of infection and state how the diagnosis in man is confirmed.
6. Contrast the morphological, cultural, and pathogenic characteristics of human and bovine types of the tubercle bacillus.
7. Define the following from a bacteriological viewpoint: (a) Widal reaction; (b) bacterial dissociation; (c) buffer.

### **PHARMACOLOGY AND MATERIA MEDICA**

#### *Answer any six questions*

1. Explain the action on the abraded skin of (a) a solution of tannic acid, (b) tincture of iodine, and (c) a solution of gentian violet.
2. Explain the action of nicotine tartrate on the lungs, heart, and blood-vessels, and on the eye.
3. Discuss the action of acetylsalicylic acid after absorption.
4. State the symptoms and outline the treatment of poisoning by arsphenamine.
5. Explain the action on the heart and blood vessels of (a) crystalline strophanthin (ouabain), and (b) amyl nitrite.
6. Name two genito-urinary antiseptics and explain their action.

7. Discuss the action of morphine sulphate on the central nervous system.
8. Explain the action on metabolism of (a) potassium and (b) insulin.

### MEDICINE

*Answer questions 1 and 2, and 3 from the remaining 4*

1. State in tabular form, the important differential diagnostic points between nephritis (hemorrhagic); (b) chronic nephrosis; (c) heart disease with edema.
2. Describe the mechanism of the normal knee-jerk and the significance of the absence of this reflex.
3. Outline the treatment of chronic bronchiectasis.
4. Compare the propriety of the administration of diuretics in (a) acute nephritis (hemorrhagic), (b) chronic nephrosis; (c) heart disease with edema.
5. What are the symptoms and signs of carcinoma of the ascending colon?
6. Describe some of the clinical manifestations of disturbance of lipid metabolism.

### SURGERY

*Answer any five questions*

1. Discuss the etiology, diagnosis, and clinical course of acute suppurative parotitis.
2. Outline the treatment of carbuncle of the neck.
3. Give the differential diagnosis and the treatment of gonococcal and of tuberculous epididymitis.
4. Discuss the significance and differential diagnosis of blood in the stools.
5. What are the indications for and against immediate amputation in a crushing injury of the right leg below the knee?
6. State the reasons for and outline the treatment of nonunion of fractures.

### OBSTETRICS AND GYNECOLOGY

*Answer any six questions*

1. What are the possible effects of uterine fibromyomata upon the course of pregnancy?
2. Discuss uteroplacental apoplexy (ablatio placentae).
3. What objections can be offered to the use of Cesarean section for incidental complications of pregnancy and labor?
4. What conditions must be fulfilled before forceps are applied? Explain.
5. Describe the types of benign polypi which may occur in the body of the uterus. Give the symptoms and treatment of each variety.
6. Give the differential diagnosis between hydramnios (polyhydramnion), ovarian cyst, and ascites. Outline the treatment of hydramnios.
7. Discuss carcinoma of the vulva from the standpoints of: (a) frequency, (b) symptoms, (c) metastases, (d) prognosis, and (e) treatment.
8. Discuss the etiology and symptoms of relaxation of the anterior vaginal wall (cystocele).

### PUBLIC HEALTH

*Answer any five questions*

1. Under what conditions would you advocate the widespread use of typhoid vaccine in the prevention of typhoid fever? Discuss its advantages and disadvantages as a permanent control measure against this disease.

2. Describe the Imhoff-tank method of sewage disposal.
3. Under what conditions of soil, climate, and occupation is hookworm disease prevalent in the United States? What are the most important measures in the control of hookworm disease?
4. By what means can the actual incidence of tuberculosis in a given population group best be ascertained? What advantages are there in determining this incidence?
5. Discuss the relationship that should prevail between the local department of health and the general practitioner in the problem of immunization.
6. What diseases may be spread by public swimming pools, and how may such transmission be prevented?
7. How are vital statistics obtained in the United States, and what use can be made of them?

### MEDICAL JURISPRUDENCE

*Answer both questions*

1. What are the autopsy findings in a case of cyanide poisoning?
2. State the difference between expert and ordinary testimony in a medicolegal case.

### DIRECTIONS

Read the questions carefully and answer concisely what is asked. Be certain to answer the exact number of questions required.

Use pen and ink only unless you prefer using pencil in drawings or diagrams.

Give data required at top of first page of each book used. Write the number of the question in center of page above each answer.

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### BOOK NOTICES

Publishers submitting books for review are requested to address them as follows:

The EDITOR, UNITED STATES NAVAL MEDICAL BULLETIN,  
*Bureau of Medicine and Surgery, Navy Department,*  
*Washington, D.C.*

A GERMAN DOCTOR AT THE FRONT, by *William His*. Translated by *Col. G. M. Blech, Medical Corps, Reserve, and Brig. Gen. J. R. Kean, Medical Corps, United States Army (Retired)*. The National Service Publishing Co., Washington, D.C.

There is so little in the way of authentic information in print as to what was happening on the German side of the lines during the World War that this work is particularly interesting. The fact that it is by His, known to all medical men by the "Auriculo-ventricular bundle of His" and the son of a famous father, one of the founders of modern embryology, is sufficient to say that it is no commonplace book. The translation is excellent.

OBSTETRICS AND GYNECOLOGY, VOL. II. Edited by *Arthur H. Curtis, M.D., head of the Department of Obstetrics and Gynecology, Northwestern University Medical School.* W. B. Saunders Company, Philadelphia, 1933.

This is an almost encyclopediac treatment of the subject. The entire set contains three volumes with a separate desk index volume. An idea of the scope may be obtained from the fact that there are 1,664 illustrations, many in color. Each subject is treated by a specialist, who writes what is essentially an exhaustive monograph.

SURGERY OF THE STOMACH AND DUODENUM, by *J. Shelton Horsley, M.D., F.A.C.S.* The C. V. Mosby Co., St. Louis, 1933. Price \$7.50.

A fine monograph by an outstanding American surgeon, splendidly printed and illustrated.

RECTAL DISEASES IN OFFICE PRACTICE, by *Lawrence Goldbacher, M.D., Lieutenant Commander (M.C.), U.S.N.R.* L. Aubrook & Co., Philadelphia, 1933.

An excellent, particularly well illustrated, and very practical book, written by a specialist, to be of assistance to the busy general practitioner.

DISEASES OF INFANCY AND CHILDHOOD, by *L. Emmet Holt and R. McIntosh, 10th edition.* D. Appleton, New York, 1933. Price \$10.

New edition of a classic text, with the latest developments in pediatrics.

THE DISEASES OF INFANTS AND CHILDREN, by *J. P. Crozier Griffith and A. G. Mitchell.* W. B. Saunders Co., Philadelphia, 1933.

New 1-volume edition of this standard text.

THE TECHNIC OF LOCAL ANAESTHESIA, by *Arthur Hertzler, Professor of Surgery of the University of Kansas.* C. V. Mosby Co., St. Louis, 1933. Price \$5.

A smaller and handier type of book on local, spinal, and sacral anesthesia. Clearness and simplicity of both text and illustration are its outstanding features. A very useful book for the young surgeon and the general practitioner who does considerable minor surgery.

TEXTBOOK OF PHYSICAL THERAPY, by *H. F. Wolf, M.D.* D. Appleton. Century Co., Inc., New York, 1933. Price \$5.50.

A new and well-printed book on the subject by the head of the department of physical therapy at Mount Sinai Hospital.

# THE DIVISION OF PREVENTIVE MEDICINE

S. S. COOK, Lieutenant Commander, Medical Corps, United States Navy, in charge

## COMMUNICABLE DISEASE CONTROL

Standard Regulations for the Control of Communicable Diseases were drawn up in 1916 by a committee of the American Public Health Association and have since passed through two revisions. The latest of these was made by the Committee on Communicable Disease Control of the White House Conference. This revision, which was printed by the Century Company in book form, was issued by the American Public Health Association in 1932 in a handbook.

Since the limitations of space do not permit full reproduction of these regulations, a few diseases have been omitted and in some instances paragraphs dealing with statistical epidemiology have been left out. In no instances has the sense of the regulations been modified, so that the instructions which follow may be regarded as authoritative and can be accepted as good practice.

### DEFINITIONS OF TERMS

The definitions of terms used in the recommended administrative measures for individual diseases are those of the American Public Health Association handbook already referred to and are as follows:

*Carrier*.—A person who, without symptoms of a communicable disease, harbors and disseminates the specific micro-organisms.

*Contact*.—A *contact* is any person or animal known to have been sufficiently near to an infected person or animal to have been presumably exposed to transfer of infectious material directly, or by articles freshly soiled with such material.

*Disinfection*.—By this is meant the destroying of the vitality of pathogenic micro-organisms by chemical or physical means.

When the word *concurrent* is used as qualifying disinfection, it indicates the application of disinfectants immediately after the discharge of infectious material from the body of an infected person, or after the soiling of articles with such infectious discharges, all personal contacts with such discharges or articles being prevented prior to their disinfection.

When the word *terminal* is used as qualifying disinfection, it indicates the process of rendering the personal clothing and immediate physical environment of the patient free from the possibility of conveying the infection to others, at the time when the patient is no longer a source of infection.

*Disinfesting*.—By *disinfesting* is meant any process, such as the use of dry or moist heat, gaseous agents, poisoned food, trapping, and so forth, by which insects and animals known to be capable of conveying or transmitting infection may be destroyed.

*Fumigation*.—By *fumigation* is meant a process by which the destruction of insects, as mosquitoes and body lice, and animals, as rats, is accomplished by the employment of gaseous agents.

*Isolation*.<sup>1</sup>—By *isolation* is meant the separating of persons suffering from a communicable disease, or carriers of the infecting organism, from other persons, in such places and under such conditions as will prevent the direct or indirect conveyance of the infectious agent to susceptible persons.

*Quarantine*.<sup>1</sup>—By *quarantine* is meant the limitation of freedom of movement of persons or animals who have been exposed to communicable disease for a period of time equal to the longest usual incubation period of the disease to which they have been exposed.

*Susceptible*.—A person or animal who is not known to have become immune to the particular communicable disease in question by natural or artificial process.

#### ACTINOMYCOSIS

1. *Etiological agent*. *Actinomyces bovis*.

1a. *Diagnostic criteria*:

(a) Clinical symptoms confirmed by

(b) Microscopical examination of discharges from the lesions.

2. *Source of infection*.—Principal source is probably infested grasses and grains.

3. *Mode of transmission*.—Chiefly by infested grasses, and so forth, infecting wounds of oral cavity.

4. *Period of incubation*.—Unknown.

5. *Communicability*.—As long as open lesions remain, as proved by the presence of the infectious agent on microscopical or cultural tests.

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<sup>1</sup> In view of the various ambiguous and inaccurate uses to which the words *isolation* and *quarantine* are not infrequently put, it has seemed best to adopt arbitrarily the word *isolation* as describing the limitation put upon the movements of the known sick or "carrier" individual or animal, and the word *quarantine* as describing the limitations put upon exposed or "contact" individuals.



6. *Administrative measures:*

- (a) *Investigation of source of infection.*
- (b) *Isolation.*—None, provided the patient is under adequate medical supervision.
- (c) *Quarantine.*—None.
- (d) *Specific therapy.*—Autogenous vaccines still on trial.
- (e) *Prophylaxis.*—None.
- (f) *Concurrent disinfection.*—Of discharges from lesions and articles soiled therewith.
- (g) *Terminal disinfection.*—By thorough cleaning.

7. *Additional special measures:*

- (a) Avoid practice of chewing straws, grass, or grains.
- (b) Inspection of meat, with condemnation of carcasses, or infected parts of carcasses of infected animals.
- (c) Destruction of known animal sources of infection.

## ANTHRAX

1. *Etiological agent.*—Anthrax bacillus, *Bacillus anthracis*.1a. *Diagnostic criteria:*

- (a) Clinical symptoms, confirmed by
- (b) Bacteriological examination.

2. *Source of infection.*—Hair, hides, flesh, feces, and blood of infected animals.3. *Mode of transmission.*—Inoculation, as by accidental wound or scratch, inhalation of spores of the infectious agent, ingestion of insufficiently cooked, infected meat, and mechanically by flies and mosquitoes.4. *Period of incubation.*—Within 7 days.5. *Communicability.*—During the febrile stage of the disease and until lesions have ceased discharging. Infected hair and hides of infected animals may communicate the disease for many months after slaughter of the animal, and after curing of hide, fur, or hair, unless disinfected.6. *Administrative measures:*

- (a) *Investigation of source of infection.*
- (b) *Isolation.*—Of the infected individual until the lesions have healed.
- (c) *Quarantine.*—None.
- (d) *Concurrent disinfection.*—Of the discharges from lesions and articles soiled therewith. Spores can be killed only by special methods such as steam under pressure or burning.
- (e) *Terminal disinfection.*—Thorough cleaning.

## CHICKEN POX

1. *Etiological agent*.—Undetermined virus present in the contents of the vesicles.

1a. *Diagnostic criteria*:

(a) *Clinical*.—An eruptive disease with superficially placed and generally distributed vesicles, with febrile symptoms variable in intensity and duration, but usually mild, brief, and coincident with the beginning of the eruption. The papular eruption, progressing to a vesicular stage within a day or two, tends to be as thickly placed on the covered as on the exposed parts of the body, and frequently appears in different stages on the same region.

(b) *Laboratory*.—None practicable.

2. *Source of infection*.—The infectious agent is present in the lesions of the skin and mucous surfaces.

3. *Mode of transmission*.—Directly from person to person; indirectly through articles freshly soiled by discharges from infected individuals. Intimate contact is not necessary.

4. *Period of incubation*.—Two to three weeks.

5. *Communicability*.—About 24 hours preceding the eruption of the skin; especially communicable during the early stage of the eruption; probably not for more than 10 days after the eruption appears.

(a) *Degree*.—Readily communicable to susceptible persons.

(b) *Immunity*.—Acquired immunity, lifelong in the great majority of instances; natural immunity, unusual.

5a. *Statistical epidemiology*:

(a) *Prevalence*.—Universal. Probably 90 percent of adults have had the disease in recognized or unrecognized form.

(b) *Age and sex distribution*.—Cases of this disease in adults are more unusual than are any of the other common infectious diseases; not very frequent in early infancy.

(c) *Racial distribution*.—No racial immunity.

(d) *Geographical distribution*.—Not limited geographically.

(e) *Seasonal distribution*.—Greatest frequency, in winter and spring.

(f) *Cyclical distribution*.—No regular cycle of prevalence.

(g) *Mortality*.—Extremely low.

(h) *Case fatality*.—About 0.01 percent.

6. *Administrative measures:*

- (a) *Investigation of source of infection.*—Reporting: Chickenpox should be reportable because cases thought to be chickenpox in persons over 15 years of age, or at any age during an epidemic of smallpox, should be investigated to eliminate the possibility of their being smallpox cases.
- (b) *Isolation.*—Patient should be excluded from school; and avoidance of contact with nonimmune persons advised. No placarding.
- (c) *Quarantine.*—None.
- (d) *Specific therapy.*—None.
- (e) *Prophylaxis*, specific.
  - Active.*—None practicable.
  - Passive.*—Convalescent serum in institutional outbreaks and in exceptional instances.
- (f) *Concurrent disinfection.*—Of articles soiled by discharges from lesions should be carried out.
- (g) *Terminal disinfection.*—None.

## CHOLERA

- 1. *Etiological agent.*—Cholera vibrio. *Vibrio comma*.
- 1a. *Diagnostic criteria:*
  - (a) Clinical symptoms, confirmed by
  - (b) Bacteriological examination.
- 2. *Source of infection.*—Discharges of the sick and of carriers.
- 3. *Mode of transmission.*—By food and water polluted by infectious agent; by contact with infected persons, carriers, or articles, freshly soiled by their discharges; by flies.
- 4. *Period of incubation.*—One to five, usually three days, occasionally longer if the healthy carrier stage before development of symptoms is included.
- 5. *Communicability:*
  - (a) *Period and degree of.*—Usually 7 to 14 days, or longer, and until the infectious organism is absent from the bowel discharges. Degree of communicability high.
  - (b) *Immunity.*—Little, natural; acquired, uncertain.
- 6. *Administrative measures:*
  - (a) *Investigation of source of infection.*—Carriers: It is important that carriers be isolated until germ free.
  - (b) *Isolation.*—For the period of communicability.
  - (c) *Quarantine.*—Valuable. Five days from last exposure or longer if stools contain cholera vibrio.
  - (d) *Specific therapy.*—None.

6. *Administrative measures*—Continued.

- (e) *Prophylaxis*—*Active*.—Vaccine reported to give good results. *Passive*.—None.
- (f) *Concurrent disinfection*.—Prompt and thorough disinfection of the stools and vomited matter. Articles used by and in connection with the patient must be disinfected before removal from the room. Food left by the patient should be burned.
- (g) *Terminal disinfection*.—Bodies of those dying from cholera should be cremated if practicable, or, otherwise, wrapped in a sheet wet with disinfectant solution and placed in watertight caskets. The room in which a sick patient was isolated should be thoroughly cleaned and disinfected.

7. *Additional special measures*.

- (a) Rigid personal prophylaxis of attendants by scrupulous cleanliness, use of rubber gloves, disinfection of hands each time after handling patient or touching articles contaminated by dejecta, the avoidance of eating or drinking anything in the room of the patient, and the prohibition of those attendant on the sick from entering the kitchen.
- (b) The bacteriological examination of the stools of all contacts to determine carriers. Isolation of carriers.
- (c) Water should be boiled if used for drinking or toilet purposes or if used in washing dishes or food containers, unless the water supply is adequately protected against contamination, or is so treated, as by chlorination, that the cholera vibrio cannot survive in it.
- (d) Careful supervision of food and drink. Where cholera is prevalent, only cooked foods should be used. Food and drink after cooking or boiling should be protected against contamination, as by flies and human handling.
- (e) As epidemic measures: Inspection service for early detection and isolation of cases; examination of persons exposed in infected centers for detection of carriers, with isolation or control of carriers; disinfection of rooms occupied by the sick; investigation of all deaths, and the detention in suitable camps for 5 days, of those desirous of leaving for another locality. Those so detained should be examined for detection of carriers.

## COCCIDIOIDAL GRANULOMA

1. *Etiological agent.*—*Coccidioides immitis*.
- 1a. *Diagnostic criteria:*
  - (a) Clinical symptoms confirmed by
  - (b) Microscopical examinations of fresh discharges, pus, and so forth, bacteriological examination, and laboratory animal inoculation.
2. *Source of infection.*—Soil and vegetation.
3. *Mode of transmission.*—Through wounds of skin contaminated with infected soil or vegetation. Inhalation of spores (laboratory workers).
4. *Period of incubation.*—Not known.
5. *Communicability.*
  - (a) *Period and degree of.*—As long as open lesions remain. Probably of slight communicability from person to person.
  - (b) *Natural and acquired immunity.*—None.
- 5a. *Statistical epidemiology.*
  - (a) *Prevalence.*—sporadic cases only.
  - (b) *Age and sex distribution.*—Most cases in adult males.
  - (c) *Racial distribution.*—All races susceptible.
  - (d) *Geographical distribution.*—Nearly all cases in California.
  - (e) *Seasonal distribution.*—May occur in any season.
  - (f) *Mortality.*—Low; disease uncommon.
  - (g) *Case fatality.*—Nearly 100 percent.
6. *Administrative measures.*
  - (a) *Investigation of sources of infection—Carriers.*—None outside of the cases themselves.
  - (b) *Isolation or quarantine.*—None.
  - (c) *Specific therapy.*—Doubtful—antimony?
  - (d) *Prophylaxis.*—Neither active nor passive.
  - (e) *Concurrent disinfection.*—Disinfection of discharges from skin lesions, lymph glands and sputa, and articles soiled by them.
  - (f) *Terminal disinfection.*—Not important.
7. *Additional special measures.*—Prompt treatment of all skin wounds, particularly in agricultural workers and other laborers. Laboratory workers must exercise care in handling cultures.

## COMMON COLDS

(Which are communicable)

1. *Etiological agent.*—Undetermined; a number of different organisms may individually or jointly be responsible.

1a. *Diagnostic criteria.*

(a) *Clinical*.—Coryza, and indisposition without other discernible cause.

(b) *Laboratory*.—None.

2. *Source of infection*.—Nasal and mouth discharges of infected persons. A cold atmosphere does not in itself produce a cold, although chilling or fatigue may predispose to it.

3. *Mode of transmission*.—Usually by droplet infection, coughed, sneezed or explosively spoken out into the air; less generally by hands to mouth, or by soiled handkerchiefs, or eating utensils.

4. *Period of incubation*.—Brief, usually 12 to 24 hours.

5. *Communicability—period and degree of*.—Communicable as long as causative agents remain in the nose or throat; period not definitely known. Highly communicable in early stages of disease and in epidemics, if cold is of the communicable type. Some so-called colds are due to tobacco or dust or other irritation and are not communicable.

5a. *Statistical epidemiology*.—Colds are the most common cause of illness. Between 10 and 15 percent of the population are affected. Colds are less common in very cold climates. They affect both sexes and all ages, and are of importance because of the amount of disability they cause and the possibility of their breaking down resistance so that other respiratory diseases may develop.

6. *Administrative measures:*

(a) Education of the public in the general laws of personal and public hygiene.

(b) Advise nonassociation with the infected.

(c) Advocate plenty of pure air and sunlight.

(d) Advise bodily resistance through health habits in regard to diet, exercise, rest, and clothing.

(e) Sanitary disposal of nose and throat discharges from cases.

## DENGUE

1. *Etiological agent*.—Undetermined.

1a. *Diagnostic criteria*.—Practically all clinical.

2. *Source of infection*.—The blood of infected persons.

3. *Mode of transmission*.—By the bites of infected mosquitoes, *Aedes aegypti*, and possibly *Culex*.

4. *Period of incubation*.—Three to ten days.

5. *Communicability:*

(a) *Period and degree of*.—Probably during fever; highly communicable where disease exists.

(b) *Immunity*.—Natural immunity, rare; acquired immunity, short-lived.

5a. *Statistical epidemiology:*

- (a) *Prevalence*.—Occurs in areas where the mosquitoes responsible for spread exist, tropics and subtropics mainly.
- (b) *Age and sex distribution*.—No differentiation.
- (c) *Racial distribution*.—Visiting whites most susceptible.
- (d) *Geographical distribution*.—As above; tropical and sub-tropical—largely in areas near sea levels.
- (e) *Seasonal distribution*.—Most prevalent in wet seasons.
- (f) *Cyclical distribution*.—Nothing marked.
- (g) *Mortality*.—Very low.
- (h) *Case fatality*.—Extremely low, under 2 percent.

6. *Administrative measures:*

- (a) *Investigation of source of infection:*
  - Reporting should be required wherever there is danger of yellow fever.
  - Significance of carriers: Not known.
- (b) *Isolation*.—The patient must be kept in a screened room during fever.
- (c) *Quarantine*.—None.
- (d) *Specific therapy*.—None.
- (e) *Prophylaxis*.—Protection from bites of infected mosquitoes.
- (f) *Concurrent disinfection*.—None.
- (g) *Terminal disinfection*.—None.

7. *Additional special measures*.—Definite measures directed toward the elimination of mosquitoes (*Aedes aegypti*). Screening of rooms.

## DIPHTHERIA

1. *Etiological agent*.—Diphtheria bacillus, the Klebs-Loeffler bacillus, *Corynebacterium diphtheriae*.1a. *Diagnostic criteria:*

- (a) *Clinical*.—Symptoms usually consist of moderate fever, and moderate sore throat, rapid pulse; lymphatic glands may be swollen, usually with the typical grayish-white adherent membrane on tonsils, pillars, posterior wall of throat, or elsewhere. Increasing inspiratory dyspnoea or stridor may be the only symptom in laryngeal cases, and a serosanguinous discharge from the nose the only symptom of nasal diphtheria.
- (b) *Laboratory*.—Diphtheria bacilli identified presumptively in smear or culture from affected mucosa.

2. *Source of infection*.—Discharges from diphtheritic lesions of nose, throat, conjunctiva, vagina, and wound surfaces. Secretions from the nose and throat of carriers of the bacillus.

3. *Mode of transmission.*—Directly by personal contact, indirectly by articles freshly soiled with discharges, or through infected milk or milk products.
4. *Period of incubation.*—Usually 2 to 5 days, occasionally longer if a healthy carrier stage precedes the development of clinical symptoms.
5. *Communicability:*
  - (a) *Period and degree of.*—Until virulent bacilli have disappeared from the secretions and the lesions. The persistence of the bacilli after the lesions have healed is variable. In fully three fourths of the cases they disappear within 2 weeks. In 95 percent of cases the bacilli disappear in 4 weeks. In exceptional cases virulent bacilli remain in the throat and discharges for from 2 to 6 months, or even longer. Diphtheria is a freely communicable disease.
  - (b) *Immunity.*—Natural, apparently frequent, increasing with age; acquired, usually permanent.
- 5a. *Statistical epidemiology:*
  - (a) *Prevalence.*—Endemic and epidemic.
  - (b) *Age and sex distribution.*—Both sexes susceptible. From 25 to 30 percent of cases and from 50 to 60 percent of the deaths occur in the age group under 5.
  - (c) *Racial distribution.*—Reported incidence is less in Negroes than in whites.
  - (d) *Geographical distribution.*—Commonest in the Temperate Zone.
  - (e) *Seasonal distribution.*—Disease generally more prevalent throughout the colder months.
  - (f) *Cyclical distribution.*—Increased prevalence occurs in irregular cycles.
  - (g) *Mortality.*—High before the use of antitoxin, toxin-antitoxin, and toxoid. Now markedly decreasing. Rates per 100,000 population in the registration area for 1926 were 7.5 and for 1927, 7.0.
  - (h) *Case fatality.*—Was very high before the use of antitoxin; now it is less than 1 percent in cases treated within 24 hours of onset and usually not higher than 6 or 7 percent for all cases.
6. *Administrative measures:*
  - (a) *Investigation of source of infection.*

*Carriers.*—From 1 to 3 percent of the urban population during the winter months are carriers of virulent organisms, but have little tendency to transmit



6. *Administrative measures*—Continued.

- (a) *Investigation of source of infection*—Continued  
disease. Known carriers should be warned against contact with children and possible infection of milk. No completely satisfactory method of carrier-control has yet been evolved. Surgery for certain types of cases has generally offered the best means of clearing up the carrier condition.
- (b) *Isolation*.—Cases should be isolated until two cultures from the throat and two from the nose, taken not less than 24 hours apart, fail to show the presence of diphtheria bacilli. Isolation may be terminated if persistent diphtheria bacilli prove avirulent. Where termination by culture is impracticable, cases may be terminated with fair safety as a rule 16 days after onset of the disease. It should be remembered that cultures made to detect bacilli in suspected convalescent or healthy carriers are not absolutely reliable. According to the care taken in prying into crypts of tonsils and touching various parts of the nasal pharynx, the results from cultures will vary in their correctness; carelessly made cultures will skip bacilli in at least 30 percent of cases, while carefully made cultures will do so only in 2 to 5 percent.
- (c) *Quarantine*.—Of all exposed persons until shown by bacteriological examination not to be carriers. Because of administrative difficulties this practice is frequently not carried out. Placarding is valuable as a warning to parents of susceptible children.
- (d) *Specific therapy*.—Treatment by diphtheria antitoxin of cases, or persons showing symptoms of the disease.
- (e) *Immunization—Prophylaxis*.—Active: By diphtheria toxoid for infants and preschool children, toxin-antitoxin for school children and for susceptible adults who are subject to repeated exposure. Passive: It is advisable to give antitoxin to little children who have been in close contact with a case of diphtheria even if they are under daily attendance of a physician, as diphtheria not infrequently develops very rapidly in infants and very young children.
- (f) *Concurrent disinfection*.—Of all articles which have been in contact with the patient and all articles soiled by discharges from the patient.
- (g) *Terminal disinfection*.—Thorough airing and sunning of the sickroom with cleaning or renovation.

7. *Additional special measures:*

- (a) Pasteurization of milk supply.
- (b) Active immunization of all preschool children preferably by the end of the first year without prior Schick testing; active immunization of school children with or without prior use of the Schick test. A Schick re-test should always be done, if possible, 3 to 6 months after giving the toxoid or toxin-antitoxin; otherwise, there is no certainty that any individual child is immune.
- (c) Application of the Schick test to all especially exposed persons, such as nurses and physicians, and active immunization of all susceptibles, but not within 3 weeks after the administration of antitoxin.
- (d) Determination of presence or absence of carriers among contacts and, so far as practicable, in the community at large. Cultures from cases which show diphtheria bacilli, so far as morphological examination permits of identification, should be tested for virulence unless the persons have been in contact with a case of diphtheria. Not only are many bacilli absolutely nonvirulent and therefore not dangerous but many others are so attenuated that they seldom produce diphtheria. As a rule, therefore, cultures are made only when there is some evidence of contact with a diphtheria case.

DYSENTERY (AMOEBIC)

1. *Etiological agent.*—*Endamoeba histolytica*.

1a. *Diagnostic criteria.*

(a) *Clinical.*—Symptoms may vary greatly from the mild to severe case. Typical symptoms include gradual onset, slight or no fever, bloody diarrhea, intermittent abdominal pain, tenesmus, gradual wasting, and cachexia. Many carriers have never suffered any clinical symptoms.

(b) *Laboratory.*—The presence of *Endamoeba histolytica* in the stools (either trophozoites or cysts).

2. *Source of infection.*—Bowel discharges of infected persons.

3. *Mode of transmission.*—By ingestion of infected material. The chief sources are impure water and food, particularly milk, uncooked vegetables and fruits contaminated with human feces. Flies may also transfer the infection.

4. *Period of incubation.*—Three to twelve weeks.

5. *Communicability:*

- (a) *Period and degree of.*—Throughout the course of the infection. The chronic case, and particularly the carrier, are much more important sources of infection than the acute case.
- (b) *Natural and acquired immunity.*—One attack of the disease does not confer immunity. Relapses are common.

6. *Administrative measures:*

- (a) *Quarantine.*—None.
- (b) *Isolation.*—None.
- (c) *Concurrent disinfection.*—Of all bowel discharges and articles soiled by them.

7. *Additional special measures:*

- (a) Sanitary disposal of human feces.
- (b) Supervision of all foods eaten raw—particularly leafy vegetables.
- (c) Protection and purification of water supplies.
- (d) Control of fly breeding.
- (e) Supervision of food handlers.

## DYSENTERY (BACILLARY)

1. *Etiological agent.*—Dysentery bacillus—*B. dysenteriae*. The common types are Shiga and Flexner.

1a. *Diagnostic criteria:*

- (a) *Clinical.*—Acute onset, fever, tenesmus, frequent and bloody stools are characteristic diagnostic criteria.
- (b) *Laboratory.*—The presence of *B. dysenteriae* in the stools.

2. *Source of infection.*—The bowel discharges of infected persons.

3. *Mode of transmission.*—Ingestion of infected material. Milk and water are less important as vectors than in typhoid fever. Food, contact, and flies are important modes of spread.

4. *Period of incubation.*—Two to seven days.

5. *Communicability:*

- (a) *Period and degree of.*—Communicable during the acute stages of the disease—3 to 4 weeks. The disease is highly communicable in prisons, camps, and institutions. In civil life its communicability is comparable to typhoid fever.
- (b) *Natural and acquired immunity.*—Adults are less susceptible than children and attacks are less severe. Immunity develops following an attack.

6. *Administrative measures:*

- (a) *Investigation of source of infection—Carriers.*—Carriers may spread the disease. They have the same significance as in typhoid fever. Some of the large epidemics reported from prisons have been traced to carrier food handlers.
- (b) *Isolation.*—In fly-proof room. No placarding on outside.
- (c) *Quarantine.*—Not employed.
- (d) *Specific therapy.*—Immune serum is of real value in infections with the Shiga strain of the dysentery bacillus. The serum has not proved of great general value in bacillary dysentery due to the multiplicity of strains.
- (e) *Prophylaxis.*—Vaccines will protect against bacillary dysentery.
- (f) *Concurrent disinfections.*—Of all bowel discharges and articles soiled by them.
- (g) *Terminal disinfection.*—Cleaning.

7. *Additional special measures:*

- (a) Sanitary disposal of human feces.
- (b) Education of mothers in the principles of careful preparation of the food of children and infants.
- (c) Control of fly breeding.
- (d) Protection and purification of public water supplies.
- (e) Pasteurization of public milk supplies.
- (f) Supervision of other food supplies, and of food handlers.

## EPIDEMIC ENCEPHALITIS

1. *Etiological agent.*—Not definitely known. Three theories:

- (a) A filterable virus closely allied to the *herpes virus*.
- (b) A strain of the green streptococcus.
- (c) A toxic disturbance of the central nervous system.

1a. *Diagnostic criteria:*

- (a) *Clinical.*—Epidemic encephalitis usually begins as an acute or subacute infection with a moderate degree of fever, headache, and malaise, often with vomiting and constipation. There are usually symptoms indicating the involvement of the central nervous system. These are of the widest possible range, and may be both organic and functional. Characteristic symptoms, which are not always present, are diplopia, or other cranial nerve palsies, lethargy and asthenia, or insomnia and restlessness, posterior nerve-root pains, twitch-

1a. *Diagnostic criteria*—Continued.

ing of groups of muscles, choreiform movements, catatonias, delirium or other psychic disturbances, changes in reflexes, especially of the pupillary reflexes. After the acute stage of the disease, which is very variable in duration, the patient may entirely recover or he may recover for several months or years, and then develop the chronic stage of the disease, or he may pass directly into the chronic stage. Relapses and periods of exacerbation are not uncommon.

(b) *Laboratory*.—The spinal fluid may be normal, but in the majority of cases there is a variable increase in cells with a preponderance of mononuclears, a slight to moderate increase in protein, and a normal or high sugar. The examination of the spinal fluid is particularly of value in ruling out other acute infections of the central nervous system. The blood count is not characteristic. There is often a mild to moderate increase in the white blood cells, sometimes with a relative mononucleosis.

2. *Source of infection*.—Not definitely known; probably the secretions of the nasopharynx.

3. *Mode of transmission*.—Not definitely known; presumably by contact with patients, or more especially with carriers.

4. *Period of incubation*.—Little information available, since there is so rarely a history of direct contact. Periods varying from 1 day to 2 months have been cited and an average of perhaps 10 days has been suggested. These figures are probably unreliable.

5. *Communicability*:

(a) *Period and degree of*.—Period of communicability unknown. Degree also unknown; probably very low.

(b) *Natural and acquired immunity*.—Most persons evidently have a high degree of immunity since there are so few records of individuals contracting the disease by exposure. This immunity is probably natural, rather than acquired, since the disease has been prevalent too short a time for most adults to have developed an acquired immunity.

6. *Administrative measures*.—In view of the low degree of communicability of the disease no administrative procedures seem necessary except the reporting of cases for statistical information, and in order that measures may be instituted in case of evidence of a marked local increase.

## GERMAN MEASLES

(Rubella)

1. *Etiological agent*.—Undetermined.
- 1a. *Diagnostic criteria*:
  - (a) *Clinical*.—A mild disease; onset with mild catarrhal symptoms for 1 day or more, followed by enlargement of postauricular lymph glands and an erythematous macular eruption beginning on the face; usually complete in 48 hours, seldom more than 72. Eruption diffuse, finely blotchy on face, but on body and extremities eruption is mostly discrete, red, and macular.
  - (b) *Laboratory*.—None, except absence of leukocytosis.
2. *Source of infection*.—Secretions of the mouth and possibly of the nose.
3. *Mode of transmission*.—By direct contact with patient or with articles freshly soiled with discharges from the nose or throat of the patient.
4. *Period of incubation*.—From 14 to 21 days, usually about 16 days.
5. *Communicability*.—Infectious from beginning of catarrhal symptoms; most infectious during acute period. Definite period of communicability unknown; probably 4 days, not longer than 7.
  - (a) *Degree of communicability*.—Highly communicable.
  - (b) *Immunity*.—One attack usually confers immunity.
6. *Administrative measures*.
  - (a) *Investigation of sources of infection*.—Reporting is desirable because this disease may be confused with scarlet fever during its early stages.
  - (b) *Isolation*.—Of no value.
  - (c) *Quarantine*.—Of no value.
  - (d) *Specific therapy*.—None.
  - (e) *Prophylaxis, specific*.—None.
  - (f) *Concurrent disinfection*.—None.
  - (g) *Terminal disinfection*.—None.

## GLANDERS

1. *Etiological agent*.—Glanders bacillus. *Pfeifferella mallei*.
- 1a. *Diagnostic criteria—Laboratory*.—By specific biological reactions, such as the complement fixation test, the mallein test, the agglutination test, or by nonspecific reactions, such as the Strauss reaction, if confirmed by culture, or by identification of the *Bacillus mallei*, or by autopsy of the doubtful cases.

2. *Source of infection*.—Discharges from open lesions of mucous membranes, or of the skin of human or equine cases of the disease (i.e., pus and mucus from the nose, throat, and discharges from skin lesions, bowel discharges from infected man and horse).
3. *Mode of transmission*.—Contact with a case or with articles freshly soiled by discharges from a human or equine case.
4. *Period of incubation*.—Unknown.
5. *Communicability*.—Until bacilli disappear from discharges, or until lesions have healed.
6. *Administrative measures*.
  - (a) *Investigation of source of infection—Carriers*.—Not known in humans.
  - (b) *Isolation*.—Human case at home or hospital; for infected horses, destruction rather than isolation is advised. Skin contact with the lesions in the living or dead body is to be scrupulously avoided.
  - (c) *Quarantine*.—Of all horses in an infected stable until all have been tested by specific reaction, and the removal of infected horses and terminal disinfection of stable have been accomplished.
  - (d) *Concurrent disinfection*.—Discharges from human cases and articles soiled therewith.
  - (e) *Terminal disinfection*.—Stables and contents where infected horses are found.
7. *Additional special measures*:
  - (a) The abolition of the common drinking trough for horses.
  - (b) Sanitary supervision of stables and blacksmith shops.
  - (c) Semiannual testing of all horses by a specific reaction where the disease is common.
  - (d) Testing of all horses offered for sale where the disease is common.

#### IMPETIGO CONTAGIOSA

1. *Etiological agent*.—Presumably cocci, chiefly streptococci and staphylococci and other undetermined pyogenic organisms.
- 1a. *Diagnostic criteria*.—Clinical: Vesicular and crusting lesions, most commonly on the face.
2. *Source of infection*.—Lesions of skin, commonly on exposed surfaces.
3. *Mode of transmission*.—Direct contact, usually one child with another—also autoinoculable.
4. *Period of incubation*.—Undetermined.

5. *Communicability*.—While lesions contain pus and remain unhealed.
6. *Administrative measures*:
  - (a) *Investigation of sources of infection*.
  - (b) *Isolation*.—In severe cases, children should be prevented from having contact with others.
  - (c) *Quarantine*.—None.
  - (d) *Specific therapy*.—None.
  - (e) *Prophylaxis*.—None.
  - (f) *Concurrent disinfection*.—Of all articles used by patient.
  - (g) *Terminal disinfection*.—None.
7. *Additional special measures*:
  - (a) Prevention of the common use of utensils such as hair brushes, combs, cups, towels, etc.
  - (b) Adequate treatment.

#### INFLUENZA, EPIDEMIC

1. *Etiological agent*.—Presumably a specific micro-organism as yet unidentified, or perhaps a group of related organisms. In addition to this supposed primary and specific micro-organism, streptococci, pneumococci, and various other bacteria play an important role in the disease, especially in its more severe complications.
- 1a. *Diagnostic criteria*:
  - (a) *Clinical*.—Epidemiological: Diagnosis rests upon the occurrence, in large numbers and over a wide area, of cases which typically show: Fairly sudden onset; fever, approximately 102° F. or higher, lasting 1 to 7 days; excessive prostration; aching pains in back and limbs; coryza and bronchitis; and frequent occurrence of pneumonia as a complication or sequel. During an epidemic in which such cases are prominent, the diagnosis of influenza is commonly extended by epidemiological association to numerous other cases of less distinctive clinical type in many of which the diagnosis would not be made independent of this association; hence, the clinical boundaries of influenza are quite indefinite.
  - (b) *Laboratory*.—Marked leukopenia in a considerable proportion of uncomplicated cases is confirmatory of the diagnosis.
2. *Source of infection*.—Persons suffering from the disease, also probably missed cases and carriers. Lower animals are not believed to harbor the infection.



3. *Mode of transmission.*—Supposedly by direct transfer of respiratory secretions from infected individuals to the respiratory tract of susceptibles.
4. *Period of incubation.*—Not definitely ascertained. Probably as a rule from 1 to 3 days.
5. *Communicability:*
  - (a) *Period of communicability.*—Communicable in the early stages of illness, probably also in the prodromal stage, and quite possibly in convalescence. Nothing is known of the duration of infectivity of supposed carriers.
  - (b) *Grade of communicability.*—High.
  - (c) *Immunity.*—Natural: Natural resistance to infection is to be inferred from the fact that a considerable proportion, usually from 25 to 75 percent of people, escape the recognizable disease, even when intimately exposed. Acquired: The same individuals may suffer repeated attacks in successive epidemics at intervals of a year or less; hence, it appears that if an attack confers any immunity, it is of short duration and probably of low grade, or perhaps is effective only against certain strains of the virus.
6. *Administrative measures:*
  - (a) *Investigation of source of infection.*
  - (b) *Isolation.*—Isolation of the sick during acute stage of the illness. It is of special importance for severe cases and for those complicated by pneumonia.
  - (c) *Quarantine.*—Placarding not recommended, but visiting should be discouraged. No restrictions on familial contacts.
  - (d) *Special therapy.*—None.
  - (e) *Immunization.*—None.
  - (f) *Concurrent disinfection.*—Of discharges from the nose and throat.
  - (g) *Terminal disinfection.*—By airing and cleaning.
7. *Additional special measures:*
  - (a) General measures should be directed toward reducing unnecessary and avoidable crowd contact, but with care to refrain from too stringent measures, since the most rigid restrictions which can be carried out by an ordinary community will not suffice to prevent.
  - (b) Community quarantine is recommended only for institutions and small, exceptionally isolated communities where such a measure is practicable without excessive inconvenience.

7. *Additional special measures*—Continued.

- (c) Under certain administrative conditions the use of masks may prove effective.
- (d) Provision for care of the sick.
- (e) Advice to the general public to go to bed immediately on appearance of symptoms.

## MALARIA

1. *Etiological agent*.—Animal parasite of the class Sporozoa, genus *Plasmodium*, or *Laverania*. There are at least three types of parasites, the tertian (*P. vivax*), aestivo-autumnal (*L. falciparum*), and quartan (*P. malariae*). The first is the most common type found in the United States, the second is less common, the last is rare.

1a. *Diagnostic criteria*:

- (a) *Clinical*.—Characteristic symptoms of regularly recurring attacks of chills and fever accompanied by an enlarged spleen.
  - (b) *Laboratory*.—Presence of the malaria parasites in the blood film.
2. *Source of infection*.—The blood of an infected individual.
3. *Mode of transmission*.—The disease is transmitted through the bite of the anopheles mosquito. The most important vector in the United States is *A. quadrimaculatus*.
4. *Period of incubation*.—About 12 to 14 days.
5. *Communicability*:

- (a) *Period of communicability*.—So long as the adult parasites persist in the circulating blood in sufficient quantities to infect mosquitoes. In untreated cases this period may last for months.
- (b) *Immunity*.—Natural: Negroes are less susceptible to the ravages of malaria. Acquired: A degree of relative immunity to the infection is acquired after repeated attacks of the disease. Good nutrition is believed to be a factor in increasing resistance to the ravages of the disease.

6. *Administrative measures*:

- (a) *Investigation of source of infection*.—Carriers: Every case may become a carrier particularly if untreated. Plasmochin may prove a satisfactory means of sterilizing the blood of carriers.
- (b) *Isolation*.—The individual harboring malaria parasites in his blood should be protected from the bites of mosquitoes. With the exception of this simple measure, isolation, quarantine, etc., are of no avail.
- (c) *Quarantine*.—As above.

6. *Administrative measures*—Continued.

(d) *Specific therapy*.—Quinine sulphate or some of the other salts of quinine. Plasmochin seems to be specific for the adult sexual form of the parasite.

(e) *Prophylaxis*:

Treatment of cases of the disease.

Control of breeding places of anopheles mosquitoes.

(f) *Concurrent disinfection*.—None. Destruction of anopheles mosquitoes in the sick room.

(g) *Terminal disinfection*.—As above.

7. *Additional special measures—in United States*:

(a) Control of anopheles quadrimaculatus breeding for the radius of its flight range from habitation.

(b) Encourage protective measures to prevent mosquitoes from biting the population by screening or other methods.

(c) Treatment of cases with quinine; carriers of adult parasites with plasmochin.

(d) Education as to mode of spread and methods of prevention.

## MEASLES

(Rubeola)

1. *Etiological agent*.—Undetermined, except that it is a filterable virus.

1a. *Diagnostic criteria*:

(a) *Clinical*.—If known to have been exposed or disease is prevalent: fever, coryza, injection of conjunctivae, cough, Koplik spots. Otherwise significance of these symptoms usually overlooked or they are not noted.

(b) *Laboratory*.—None.

2. *Source of infection*.—Mouth and nasal secretions of an infected individual.

3. *Mode of transmission*.—Usually through direct contact with case. Instances of indirect contact seem to be authentic but this mode is of importance only in institutions caring for infants and small children.

4. *Period of incubation*.—Usually about 8 to 10 days from exposure to initial fever, 12 to 14 days to rash. Shorter incubation periods unusual and difficult to authenticate. Occasionally longer periods up to 18 days. When convalescent serum has been used the incubation period may last even longer, at least up to 21 days.

5. *Communicability:*

- (a) *Period and degree of.*—Communicable from onset of catarrhal symptoms until 5 days after appearance of the rash. One of the most easily transmissible of the communicable diseases.
- (b) *Immunity.*—Natural: Natural immunity during first 3 to 6 months of life of children born of mothers who have had the measles. Occasional instances of a natural immunity lasting through life or well into maturity occur. Acquired: A vast majority, probably over 90 percent, of those reaching 20 years of age have acquired an active immunity through having had an attack.

6. *Administrative measures:*

- (a) *Investigation of sources of infection—Carriers.*—Not known to exist. Reporting: Every effort should be made to secure complete reporting and to discover susceptibles who by their physical condition would make infection especially hazardous.
- (b) *Isolation.*—Isolation primarily for benefit of patient (to reduce promiscuous contact and likelihood of secondary infections) except in institutions caring for young or defective children. Isolation at very onset or before may protect young children. Probably easier, however, to isolate children under 2 years old to prevent their contact with older children who have been definitely or probably exposed. In hospitals and institutions complicated cases must be strictly isolated.
- (c) *Quarantine.*—Of premises and contacts discourages reporting through the inconvenience and annoyance thereby caused. As a large number of the actual cases are unreported under such circumstances the practice has no effect on the rate or the extent of spread. Quarantine of institutions for young children and of exposed wards in them is of some value. Wards containing very young children should be strictly quarantined if measles appears in the institution. Placarding, like quarantine, discourages reporting and has no appreciable effect on the spread. The warning to neighbors is much better accomplished through personal visits to mothers of the neighborhood, telling them of the presence of the disease, how to recognize it, its dangers, especially to young children, the desirability of reporting it, and the need for adequate medical and nursing care.

6. *Administrative measures*—Continued.

(d) *Immunization*.—*Active*.—None. *Passive*.—Passive immunity lasting a few weeks (possibly as long as 4 weeks) may be conferred by the injection of convalescent serum or whole blood of immunes. Dose of former 4–10 cc; of latter 20–50 cc, according to size. Citrated whole blood may be used but the amount should be increased 20 percent. If possible the blood of several persons should be mixed so as to have an average potency. This must be given within 5 days of exposure to prevent, or on fifth or sixth day to modify. Reports generally favorable but has failed to protect or modify, in a number of instances outbreaks in institutions. Nonspecific prophylactic. Prevention and cure of rickets, malnutrition, and so forth, reduces frequency of complications and deaths.

(e) *Concurrent disinfection*.—Beyond that demanded by esthetic considerations disinfection is of no tangible value except in institutions—and that needed to prevent transmission through medical and nursing attendants.

(f) *Terminal disinfection*.—None.

7. *Additional special measures*.—Should be designed primarily to reduce mortality. Infants in asylums should be kept in best possible condition, special attention being given to prevention and cure of rickets. Such institutions should in effect be quarantined during outbreaks in vicinity, and if invaded, special attention should be given to care of those attacked. Convalescent serum, or in its absence citrated blood or serum of adults who have had measles should be given if available, to children under 3, but should not be relied upon alone. With a potent serum the disease will usually either be modified or prevented. In the community at large, extra nursing personnel should be employed. Cases should be investigated to ascertain family contacts under three years of age so that the parents may be instructed in the particular danger of measles to these children and shown how best to arrange for the care of the sick and those who will probably come down later. Families in the neighborhood who have children of this age, or physically handicapped children, should also be visited and instructed, and efforts made to improve physical condition if impaired. Convalescent serum should be made available for use in suitable cases. Adequate medical and nursing care should be provided for the indigent, and in exceptional circumstances hospitaliza-

7. *Additional special measures*—Continued.

tion should be provided. Cases should be isolated for their own protection.

MENINGOCOCCUS MENINGITIS

1. *Etiological agent*.—Meningococcus, *Neisseria intracellularis* or closely allied species.
- 1a. *Diagnostic criteria*:
  - (a) *Clinical*.—Usually sudden onset, fever, headache, nausea, rigidity of the neck, and sometimes in epidemics, petechial spots on the skin.
  - (b) *Laboratory*.—The presence of the organism in the spinal fluid; in early stages it may sometimes be found by blood culture.
2. *Source of infection*.—Discharges from the nose and mouth of infected persons. Clinically recovered cases and healthy persons who have never had the disease but have been in contact with cases of the disease or other carriers act as carriers and are commonly found, especially during epidemics. Such healthy carriers are not uncommonly found independent of epidemic prevalence of the disease.
3. *Mode of transmission*.—By direct contact with infected persons or carriers harboring the causative agent in the upper respiratory tract. There is the possibility of spread by articles soiled by nasal and mouth discharges from such persons, but as the causative agent dies rapidly outside the human body the probability of spread by this means is slight.
4. *Period of incubation*.—Two to ten days; tends to be short in epidemics. In rare cases where a carrier develops the disease, the period may be longer.
5. *Communicability*:
  - (a) *Period and degree of*.—Communicable during the clinical course of the disease and until the specific organism is no longer present in the nasal and mouth discharges of the patient. The organism usually disappears from the nasopharynx in two weeks from onset of disease. This is also about the duration of the carrier state. Infection is fairly widespread at all times but, except during epidemic periods, clinical cases are rare. The disease is one of low infectivity.
  - (b) *Immunity*.—Natural: There is usually a natural resistance to the disease except in severe epidemics. Acquired: The extent of immunity from having the disease is unknown.

6. *Administrative measures:*

- (a) *Investigation of source of infection—Carriers.*—The healthy carrier is probably the most important factor in the spread of the disease, but bacteriological control is usually impractical.
- (b) *Isolation.* Isolation and placarding are advisable. Two weeks is an arbitrary period and is usually sufficiently long.
- (c) *Prophylaxis—Active.*—None practical. *Passive.*—None.
- (d) *Specific therapy.*—Highly potent antimeningococcus serum of suitable type specificity is believed by most observers to be of value, but no adequate criterion of potency is available except local clinical experience.
- (e) *Concurrent disinfection.*—Of discharges from the nose and mouth and of articles soiled therewith.
- (f) *Terminal disinfection.*—Cleaning.

7. *Additional special measures:*

- (a) Education as to personal cleanliness and necessity of avoiding contact and droplet infection.
- (b) Prevention of overcrowding such as is common in living quarters, transportation conveyances, working places, and places of public assembly in the civilian population, and in inadequately ventilated closed quarters in barracks, camps, and ships among military units.

8. *Epidemic measures.*—Increase the separation of individuals and the ventilation in living quarters for such groups of people as are especially exposed to infection because of their occupation or some necessity of living conditions. Chilling, bodily fatigue, and strain should be minimized for those especially exposed to infection.

## MUMPS

1. *Etiological agent.*—Undetermined.1a. *Diagnostic criteria:*

- (a) *Clinical.*—Inflammation of Stenson's duct may assist in early diagnosis. Diagnosis is usually determined by history of contact, or swelling of parotid gland (below and in front of the ear). The gland on one side is usually affected first, to be followed in a day or two by the other. The disease may be limited to other salivary glands.
- (b) *Laboratory.*—Findings of no value for diagnosis.

2. *Source of infection.*—Secretions of the mouth and possibly of the nose.

3. *Mode of transmission.*—By direct contact with an infected person or with articles freshly soiled by the secretions or discharges from the mouth or nose of infected persons. Carriers and missed cases may be factors in the spread of the disease.
4. *Period of incubation.*—From 12 to 26 days. The most common period, 18 days, is accepted as usual. A period of 21 days is not uncommon.
5. *Communicability—Period and degree of.*—Limit of communicability is undetermined, but assumed to be from first symptoms or earlier until enlargement of the gland has disappeared, seldom more than 12 days after onset. Mumps has a high degree of communicability; practically everyone is susceptible.
6. *Administrative measures.*
  - (a) *Investigation of sources of infection.*
  - (b) *Isolation.*—Isolation of the patient from young children and susceptible young people should be advised for the period of communicability, particularly in institutional outbreaks.
  - (c) *Quarantine.*—Not required.
  - (d) *Specific therapy.*—None.
  - (e) *Prophylaxis.*—Whole blood or serum from persons who have recently recovered from the disease gives beneficial results in preventing infection among contacts.
  - (f) *Concurrent disinfection.*—Of all secretions and discharges from the mouth and nose of patient should be practiced.
  - (g) *Terminal disinfection.*—None.
7. *Additional special measures.*—In lodging houses, boarding schools, and institutions where the spread would be for the most part among adults or adolescents, isolation of cases and known contacts is apparently justifiable.

#### PARATYPHOID FEVER

1. *Etiological agent.*—Paratyphoid bacillus A or B or C; *Salmonella paratyphi*; *Salmonella schottmulleri*; *Salmonella herschfeldi*.
- 1a. *Diagnostic criteria.*—Clinical symptoms confirmed by specific agglutination test, and by bacteriological examination of blood, bowel discharges, or urine.
2. *Source of infection.*—Bowel discharges and urine of infected persons, and water or foods contaminated with such discharges of infected persons or of healthy carriers.
3. *Mode of transmission.*—Directly by personal contact; indirectly by contact with articles freshly soiled with the discharges of infected persons or through milk, water, or food contaminated by such discharges.



4. *Period of incubation*.—Four to ten days; average, seven days.
5. *Communicability period*.—From the appearance of prodromal symptoms, throughout the illness and relapses, during convalescence, and until repeated bacteriological examination of discharges show absence of the infecting organism.
6. *Administrative measures*:
  - (a) *Investigation of source of infection*.—Healthy carriers may be numerous in an outbreak.
  - (b) *Isolation*.—In fly-proof room, preferably under hospital conditions, of such cases as cannot command adequate sanitary environment and nursing care in their homes.
  - (c) *Quarantine*.—None.
  - (d) *Specific therapy*.—None.
  - (e) *Concurrent disinfection*.—Disinfection of all bowel and urinary discharges and articles soiled with them.
  - (f) *Terminal disinfection*.—Cleaning.
7. *Additional special measures*:
  - (a) Protection and purification of public water supplies.
  - (b) Pasteurization of public milk supplies.
  - (c) Supervision of other food supplies and of food handlers.
  - (d) Prevention of fly breeding.
  - (e) Sanitary disposal of human excreta.
  - (f) Supervision of paratyphoid carriers and their exclusion from the handling of foods.
  - (g) Systematic examination of fecal specimens from those who have been in contact with recognized cases to detect carriers.
  - (h) Exclusion of suspected milk supplies pending discovery of the personal or other cause of contamination of the milk.
  - (i) Exclusion of water supply, if contaminated until adequately treated with hypochlorite or other efficient disinfectant, or unless all water used for toilet, cooking, and drinking is boiled before use.

## PNEUMONIA

### (Lobar)

1. *Etiological agent*.—Various pathogenic bacteria commonly found in the nose, throat, and mouth, chiefly the pneumococcus, occasionally the bacillus of Friedlander, the influenza bacillus, etc.
- 1a. *Diagnostic criteria*.—Clinical symptoms. Specific infecting organisms may be determined by serological and bacteriological tests early in the course of the disease.

2. *Source of infection*.—Discharges from the mouth and nose of healthy carriers, as well as of infected individuals, and sometimes articles freshly soiled with such discharges.
3. *Mode of transmission*.—By direct contact with an infected person, or with articles freshly soiled with the discharges from the nose or throat of (and possibly from infected dust of rooms occupied by) infected persons.
4. *Period of incubation*.—Thought to be short, usually 2 to 3 days.
5. *Communicability*.—(a) *Period*.—Unknown; presumably until the mouth and nasal discharges no longer carry the infectious agent in an abundant amount or in a virulent form.
6. *Administrative measures*:
  - (a) *Investigation of source of infection*:

Carriers are numerous.  
The early reporting of pneumonia is highly desirable.
  - (b) *Isolation*.—Of patient during clinical course of the disease.
  - (c) *Quarantine*.—None.
  - (d) *Specific therapy*.—None; still on trial.
  - (e) *Prophylaxis*.—Specific still experimental.
  - (f) *Concurrent disinfection*.—Discharges from the nose and throat of the patient.
  - (g) *Terminal disinfection*.—Thorough cleaning, airing, and sunning.
7. *Additional special measures*.—In institutions and camps, when practicable, people in large numbers should not be congregated closely within doors. The general resistance should be conserved by good feeding, fresh air, temperance in the use of alcoholic beverages, the avoidance of chilling, and other hygienic precautions.

### POLIOMYELITIS

#### (Infantile Paralysis)

1. *Etiological agent*.—A filterable virus of undetermined morphology.
- 1a. *Diagnostic criteria*:
  - (a) *Clinical*.—Symptoms of a mild gastro-intestinal upset (headache, moderate fever, and vomiting) associated with stiffness of neck and spine, and a coarse tremor. The mind is usually clear, though the patient may seem drowsy and irritable. Duration of this stage is about 3 days. In many cases paralysis or muscle weakness develops after this.

1a. *Diagnostic criteria*—Continued.

(b) *Laboratory*.—The spinal fluid is characteristically under moderate pressure, the cells and globulin increased, with normal sugar content.

2. *Source of infection*.—Human carriers and patients.

3. *Mode of transmission*.—By direct contact with infected persons, including carriers of the virus, or indirectly by contact with articles freshly soiled with nose, throat, or bowel discharges of such persons. There is substantial evidence of spread by milk, but this mode of spread is an unusual one.

4. *Period of incubation*.—Usually 7 to 14 days.

5. *Communicability*:

(a) *Period and degree of*.—The data are incomplete but suggest a period including the incubation period and probably the first week of the disease. The incidence of the disease among those associated with the sick is low. This is doubtless due to the fact that only a very small proportion of persons exposed to the virus contract the disease.

(b) *Immunity*.—Natural: Natural immunity in infants is derived from placental transmission from immune mothers. This disappears in most instances within a year. Acquired immunity: In the age group 1 to 5 years, immunity is relatively infrequent, but with increase in age, immunity is found with increasing frequency until adult life, when the majority of individuals in urban populations are immune. In rural populations the same process of immunization takes place but at a considerably slower rate.

6. *Administrative measures*:(a) *Investigation of source of infection*:

*Carriers*.—Although healthy carriers are doubtless of far greater importance numerically than cases as spreaders of the virus, there is as yet no practical method for detecting them; hence, no method of handling carriers can be developed further than quarantine of contacts as presumptive carriers.

*Reporting*.—Reporting of cases and suspected cases should always be required, especially that proper care may be provided.

(b) *Isolation*.—Of all paralytic cases for 3 weeks from febrile onset.

(c) *Quarantine*.—Of exposed children of the household and of adults of the household insofar as their vocation

6. *Administrative measures*—Continued.

brings them into contact with children or makes them food handlers, for 21 days from the last exposure. No placarding.

(d) *Specific therapy*.—Convalescent serum seems the rational form of treatment in the preparalytic stage of the disease and is usually administered intraspinally or intravenously, or by both routes.

(e) *Prophylaxis*.—Active, none; passive is still experimental.

(f) *Concurrent disinfection*.—Nose, throat, and bowel discharges and articles soiled therewith.

(g) *Terminal disinfection*.—Cleaning.

7. *Additional special measures in outbreaks*:

(a) Search for and examination of all sick children.

(b) All children with fever should be isolated pending diagnosis.

(c) Education in such technique of bedside nursing as will prevent the distribution of infectious discharges to others from cases isolated at home.

(d) Protection of children from contact in general in times of epidemics.

(e) Facilities for early diagnosis and treatment (serum) through some central agency for collection of serum, administered under studied condition for drawing conclusions.

(f) Facilities for after-care. Proper orthopedic treatment should be provided. The essentials are preservation of remaining muscle strength, prevention of contractions and deformities, and corrective treatment.

## PSITTACOSIS

1. *Etiological agent*.—A filterable agent.1a. *Diagnostic criteria*:

(a) *Clinical*.—Onset, chilly sensations, fever, headache, with early pneumonic involvement; cough absent or usually nonproductive if present. Tongue, white coat; anorexia extreme; constipation the rule; pulse usually slow in relation to temperature. Delirium common; albuminuria almost constant; relapses not uncommon.

(b) *Laboratory*.—White blood count normal or slightly increased early, with leukopenia later. The disease may be transmitted to healthy susceptible birds or mice by inoculating blood drawn preferably during first week of illness; rabbits and guinea pigs susceptible to intracerebral inoculation.

2. *Source of infection*.—Newly acquired ill parrots, parrakeets, love-birds, canaries. Apparently well birds occasionally transmit the infection.
3. *Mode of transmission*.—Contact with infected birds or their recent surroundings; unusually through a human case.
4. *Period of incubation*.—Six to fifteen days.
5. *Communicability*.—Ill birds and their surroundings highly infectious for man; patients much less dangerous.
- 5a. *Statistical epidemiology*.—Usually in sudden house outbreaks among persons exposed to ill tropical birds. All ages susceptible, but more severe in higher age groups. Deaths mainly confined to persons over 30 years of age. Females more frequently attacked than males. Case fatality 20 to 50 percent, or even higher.
6. *Administrative measures*:
  - (a) *Investigation of source of infection—Carriers*.—Apparently healthy birds occasionally convey the disease; human carriers unknown.
  - (b) *Isolation*.—Of doubtful value, owing to low infectivity from patients to man.
  - (c) *Quarantine*.—Buildings which housed birds should be quarantined until thoroughly cleansed and disinfected.
  - (d) *Specific therapy*.—Intravenous or intramuscular administration of convalescent serum, 50 to 100 cc daily is worthy of trial.
  - (e) *Specific prophylaxis*.—None.
  - (f) *Concurrent disinfection*.—Of all discharges.
  - (g) *Terminal disinfection*.—Incriminated birds should be sacrificed and their bodies and cages burned.
7. *Additional special measures*:
  - (a) Prohibition of traffic in South American parrots.
  - (b) Quarantine of homes and pet shops known to have harbored infected birds until thoroughly cleansed.
  - (c) Education of community.

#### RABIES

1. *Etiological agent*.—A filterable virus.
- 1a. *Diagnostic criteria in animals*:
  - (a) *Clinical*.—Any unexplained change in disposition of an animal followed by a period of excitability or paralysis, and death within 10 days.
  - (b) *Laboratory*.—Negri bodies in nerve cells. Animal inoculation with suspected tissue. In absence of laboratory findings, diagnosis must be based upon history and clinical symptoms.

2. *Source of infection*.—Saliva of infected animals, chiefly dogs.
3. *Mode of transmission*.—Inoculation with saliva of infected animals through abrasion of skin or mucous membrane, almost always by bites or scratches. The virus may penetrate through microscopic abrasions of apparently normal skin licked by a rabid animal, but this is unusual.
4. *Period of incubation*.—Usually somewhat less than 6 weeks. May vary from 2 weeks to 6 months or more, depending upon the amount and virulence of the virus and the nature and site of the lesion in relation to nerve supply.
5. *Communicability*.—Communicable from 5 days before onset of symptoms to death of animal.
  - (a) *Period and degree of*.—Varies with the origin, nature, virulence and amount of virus, site and character of the wound, and susceptibility of the victim.
  - (b) *Immunity*.—Natural immunity unknown; antirabic treatment induces acquired immunity.
6. *Administrative measures*:
  - (a) *Investigation of sources of infection—Carriers*.—None.
  - (b) *Isolation*.—Isolation of patient without quarantine or placard.
  - (c) *Quarantine*.—None.
  - (d) *Specific therapy*.—None.
  - (e) *Prophylaxis*:
    - Active*.—Immunization by antirabic treatment after exposure, before development of symptoms.
    - Passive*.—None.
    - Prompt treatment of suspected bites by fuming nitric acid.
  - (f) *Concurrent disinfection*.—Concurrent disinfection of saliva of patient and articles soiled therewith.
  - (g) *Terminal disinfection*.—Thorough cleaning.
7. *Additional special measures*:

Animals, particularly dogs, constitute the reservoir of infection.

Preventive measures relate to animals and exposed persons.

A. *Animals*:

  - (a) Require license for dogs.
  - (b) Destroy all unlicensed dogs.
  - (c) Investigate all cases or suspected cases of rabies among animals.
  - (d) Quarantine all dogs in areas where known rabid animals have run at large.
  - (e) Provide laboratory facilities for examination of tissue specimens.

7. *Additional special measures*—Continued.

B. *Exposed persons*.—Provide antirabic treatment at public expense for exposed persons.

## RINGWORM AND FAVUS

The diseases commonly spoken of as ringworm are infections of the skin, hair, or nails, with one of a closely related group of fungus parasites. The parasites are a primitive form of vegetable organism and resemble the familiar molds which occur on damp clothing, cheese, bread, etc. There are many species in this group. Some only invade the skin, others invade the hair or the nails as well. Some have a predilection for the scalp; others for the folds of skin or areas like the palms of the hands or the soles of the feet which are kept moist by sweat. Some are known to attack only human beings; others attack cats, dogs, horses, and pet birds, and these infected animals are frequently a source of contagion for types attacking the scalp. The different parasites vary somewhat in virulence also. Some cause mild scaling patches, others deep inflamed areas with the formation of pus. They occasionally invade the lymph nodes, gaining access to the blood stream and in this way produce more or less transient eruptions in areas of the body distant from the original disease. The more important types of this infection are ringworms of the scalp, favus of the scalp, ringworm of the body, and ringworm of the feet and groin.

## A. RINGWORM OF BODY AND OF FEET AND GROIN

1. *Etiological agent*.—*Trichophyton* or *epidermophyton*.

1a. *Diagnostic criteria*:

(a) *Clinical*.—Inspection.

(b) *Laboratory*.—Microscopical examination.

2. *Source of infection*.—Infected persons or articles recently contaminated by them.

3. *Mode of transmission*:

(a) Indirect contact—for feet: Floors of swimming pools, and gymnasiums, exchange of shoes.

(b) Direct contact.

4. *Period of incubation*.—Undetermined.

5. *Communicability*:

(a) *Period and degree of*.—Communicable throughout infection; high degree of communicability.

(b) *Immunity*.—None.

5a. *Statistical epidemiology*:

(a) *Prevalence*.—The foot form of ringworm is quite prevalent among adults but only rarely occurs in children.

5a. *Statistical epidemiology*—Continued.

(b) *Age and sex distribution*.—Most foot cases are in male adolescents. Most body or face cases are among young children.

(c) *Seasonal distribution*.—The peak is in warm weather.

6. *Administrative measures*:

(a) *Investigation of source of infection—Carriers*.—About 50 percent of the population are, according to estimates, carriers of the fungi causing ringworm of the feet or groin. It is difficult to distinguish carriers from mild clinical cases.

(b) Rigid exclusion of marked cases from gymnasiums and swimming pools, but not from school.

(c) Adequate and persistent treatment. Ringworm of the body or face is an easily treated eruption. Its chief danger lies in the possibility of the scalp becoming infected.

(d) This disease may be prevented by wearing proper shoes or slippers in gymnasiums; treatment of lesions with iodine and collodion usually clears up the condition.

## B. RINGWORM OF SCALP AND FAVUS

(The methods of diagnosis and treatment are the same for ringworm of scalp and for favus)

1. *Etiological agent*.—*Microsporon*, *Trichophyton*, *Achorion schoenleinii* (Favus).

1a. *Diagnostic criteria*:

(a) *Clinical*.—Direct inspection.

(b) *Laboratory*.—Microscopical examination. Examination of infected hairs in a dark room under ultraviolet light passed through a wood filter causes the hairs to glow and makes diagnosis easy. This may be used where there are epidemics in institutions as the apparatus is expensive to use for individual cases.

2. *Source of infection*.—Infected persons, animals, or articles recently contaminated by them.

3. *Mode of transmission*.—Direct contact, or indirectly by caps, pillows, etc.; also contact with animal hosts, chiefly cats.

4. *Period of incubation*.—Unknown.

5. *Communicability*:

(a) *Period and degree of*.—Throughout infection and until healthy hair begins to grow. Degree, high.

(b) *Immunity*.—Persons over 15 years are practically immune to ringworm of the scalp but never to favus.



5a. *Statistical epidemiology*.—Ringworm is common in the United States, but favus is rare, particularly in children. Most cases of favus are imported from east and south Europe.

6. *Administrative measures*:

- (a) *Investigation of sources of infection*.
- (b) *Isolation*.—Absolute exclusion from school. Confinement to the house is impractical.
- (c) *Specific therapy*.—X-ray or the giving of thallium acetate by mouth (unsafe in children under 12 years) are the only reliable remedies. Cure is often difficult.
- (d) Adequate treatment of cases, and constant cleanliness of the scalp are the best preventive measures.

ROCKY MOUNTAIN SPOTTED FEVER

1. *Etiological agent*.—Gram negative, intracellular, noncultivable and nonfilterable organisms (*Dermacentroaenus rickettsi* Wolbach). Behavior in animal and anthropoid host indicates a distinct life cycle.

1a. *Diagnostic criteria*:

- (a) *Clinical*.—History of tick bite; characteristic rash.
- (b) *Laboratory*.—Animal inoculation; positive Weil-Felix test.

2. *Source of infection*.—Wild rodents, which serve largely as healthy carriers.

3. *Mode of transmission*.—Bite of tick *Dermacentor andersoni*, mashing infected ticks on hands or other body surfaces.

4. *Period of incubation*.—Three to ten days.

5. *Communicability*.—Not communicable from man.

5a. *Statistical epidemiology*:

- (a) *Geographical distribution*.—Limited to Rocky Mountain area.
- (b) *Seasonal distribution*.—Spring and early summer, corresponding to appearance of adult ticks.
- (c) *Mortality*.—Varies with locality.
- (d) *Case fatality*.—Varies with locality, 90 percent in some areas; as low as 5 percent in others.

6. *Administrative measures*:

- (a) *Investigation of source of infection*.
- (b) *Isolation*.—None.
- (c) *Quarantine*.—None.
- (d) *Specific therapy*.—None.
- (e) *Prophylaxis*:
  - Active*.—Use of Spencer-Parker vaccine has given very encouraging results.
  - Passive*.—None.

6. *Administrative measures*—Continued.

(f) *Concurrent disinfection*.—All ticks on the patient should be destroyed.

(g) *Terminal disinfection*.—None.

7. *Additional special measures*:

(a) Personal prophylaxis of persons entering the infected zones during the season of ticks by wearing tickproof clothing, and careful daily search of the body for ticks which may have attached themselves.

(b) The destruction of ticks by clearing and burning vegetation on the lands in infected zones.

(c) The destruction of ticks on domestic animals by dipping.

(d) The destruction of small mammalian hosts, as ground squirrels, chipmunks, and so forth.

## SCARLET FEVER

1. *Etiological agent*.—Hemolytic streptococcus.1a. *Diagnostic criteria*:

(a) *Clinical*.—Sudden onset with nausea, vomiting, fever, sore throat and rash (bright red spots on subcuticular flush) on second or third day. Cases occur without eruption when provisional diagnosis may be made on sore throat, fever, vomiting, and history of exposure. The Schultz-Charlton blanching phenomenon may be used when rash has appeared; one tenth to one half cc convalescent serum or scarlet fever antitoxin is injected into skin where rash exists which causes local blanching, in 6 to 36 hours, if rash is scarlatinal; absence of blanching, however, does not rule out scarlet fever.

(b) *Laboratory*.—Bacteriological diagnosis is generally impractical.

2. *Source of infection*.—Discharges from the nose, throat, ears, abscesses, or wound surfaces of sick or convalescent patients and articles freshly soiled therewith. The nose and throat discharges of carriers may also spread the disease.

3. *Mode of transmission*.—Directly by personal contact with an infected person; indirectly by articles freshly soiled with discharges of an infected person or through contaminated milk or milk products. Infection does not occur from skin desquamation.

4. *Period of incubation*.—Usually 3 or 4 days. Rarely within 24 hours and seldom over 1 week.

5. *Communicability:*

(a) *Period and degree of.*—Three weeks from the onset of the disease, without regard to the stage or extent of desquamation, and until all abnormal discharges have ceased and all open sores or wounds have healed. Communicable, but not to the degree of measles or smallpox.

(b) *Immunity.*—Unnoticed infections may occur and produce immunity. Lasting immunity is usual after attack, but second attacks do occur.

6. *Administrative measures:*

(a) *Investigation of sources of infection—Carriers.*—Existence undetermined, although probably exist.

(b) *Isolation.*—In home or hospital, maintained in each case until the end of the period of infectivity. If medical inspection is not available, isolation for period of communicability.

(c) *Quarantine.*—Exclusion of exposed children and teachers from school, and food handlers from their work, until 7 days have elapsed since last exposure to a recognized case. Placarding helps to control when associated with other measures.

(d) *Specific therapy.*—The use of potent scarlet fever antitoxin is of value in shortening the course of the disease. The antitoxin should be administered within 3 days of the onset of disease. Specific therapy, however, is still controversial. Convalescent serum is used effectively in severe septic cases.

(e) *Immunization:*

*Active.*—Active immunity may be produced by a suitable streptococcus antigen, but its practical value is at present undetermined.

*Passive.*—Passive immunization not at present generally advisable with any but human convalescent serum.

(f) *Concurrent disinfection.*—Of all articles which have been in contact with a patient and all articles soiled with discharges of the patient.

(g) *Terminal disinfection.*—Thorough cleaning.

### SMALLPOX

1. *Ethiological agent.*—A virus present in the lesions on skin and mucous membranes, probably filterable with difficulty, and giving rise to inclusion bodies in the cytoplasm and in the nuclei of tissue cells.

1a. *Diagnostic criteria:*

(a) *Clinical*.—The distribution of the eruption, usually general and symmetrical, favoring prominences, extensor surfaces, and surfaces exposed to irritation, while tending to avoid protected surfaces, flexures, and depressions; most abundant and earliest on face, next forearms and wrist, favoring the limbs, especially distally, more than the trunk; more abundant on shoulders and chest than on loins and abdomen. The individual lesions are deep seated and have an infiltrated base, except when modified naturally or by previous vaccination; they are circular if not so thickly placed as to be fused. The course of the disease is characteristic, with 1 to 5 days of febrile symptoms before the eruption, which is papular for 1 to 4 days, vesicular for 1 to 4 days, and pustular for 2 to 6 days; then crusts form which fall off 10 to 40 days after the first sign of the lesion, leaving a red scar which fades gradually. Any case of purpura or hemorrhage with fever should be considered as smallpox of the most fatal sort until another diagnosis is clear.

(b) *Laboratory*.—Not generally advisable.

2. *Source of infection*.—Lesions of the mucous membranes (mouth, nose, and throat) and skin of infected persons.

3. *Mode of transmission*.—By contact with persons sick with the disease; this contact need not be very intimate, but aerial transmission through more than a few feet is unlikely. The infection may be passively carried by inanimate and by animate objects (persons, insects) which have been contaminated from persons having smallpox, but such passive infectivity is of brief duration.

4. *Period of incubation*.—Seven to twenty-one days, tending to be longer with the milder strains; commonly about 14 days from effective exposure to the beginning of the eruption. Observation for 16 days after exposure is usually adequate to detect all cases among contacts if temperatures are taken daily.

5. *Communicability:*

(a) *Period and degree of*.—Specially communicable in the early eruptive stage, when lesions are present in the mouth, nose, and throat, but patients should be isolated from the first evidence of fever until the skin, including the soles of the feet, is free from the primary crusts of the eruption. One of the most readily communicable diseases known. Exposure without contracting the disease occurs but is no definite evidence of immunity.

### 5. *Communicability*—Continued.

(b) *Immunity*.—Natural: Absolute natural immunity to smallpox in all probability does not exist, but certain individuals are more severely affected than others following exposure to the same source of infection. Acquired: Immunity conferred by an attack usually persists throughout life, but second attacks occasionally occur. Immunity acquired by vaccination is usually complete for from 5 to 20 years, but some individuals lose their immunity in less time, so that in case of definite exposure to severe smallpox, vaccination with fully potent virus should be performed at once, unless this has been done within a year. The reaction of immunity, after vaccination with fully potent vaccine is complete evidence of immunity.

### 6. *Administrative measures*:

#### (a) *Investigation of source of infection*:

*Carriers*.—Active carriers of the disease, without symptoms, are unknown, but persons may be passive carriers in the same sense as other infected objects, the infection persisting for only a brief time; and vaccinated persons may develop clinically unrecognizable forms of the disease and serve as sources of infection.

*Reporting*.—Strict and prompt reporting of cases should be enforced, and professional visits made so that vaccination of persons who have been exposed can be completed within 24 hours. Those exposed and unvaccinated should be quarantined. The vaccinated should be observed daily until the vaccination reaction has begun to subside, if vaccination was performed within 24 hours of first exposure, otherwise for 16 days from last exposure.

(b) *Isolation*.—Of great value and should be strictly enforced. Home isolation is not usually as effective as isolation in a contagious-disease hospital. Special strictness must be observed for all cases of severe smallpox. Recent vaccination with fully potent virus should be insisted on for all persons who may be even remotely exposed, and the possibility of vaccinated persons transporting the infection passively on skin, mucosa, or clothing is to be borne in mind.

(c) *Quarantine*.—As above.

(d) *Specific therapy*.—None.

6. *Administrative measures*—Continued.(e) *Immunization*:

*Active*.—Vaccination is essential for the control of the disease. Vaccination should be performed some time previous to exposure to insure protection but if performed on the day of exposure it will almost always protect. In order to avoid sore arms and other possible complications of vaccination, it is very important that the vaccine insertion should be as small and superficial as practicable, not over one eighth inch in any direction, and that the site should be kept dry. The pressure method as recommended by the United States Public Health Service is preferred; not over 10 pressures with the side of the needle point for primary vaccinations, and 30 for revaccinations. Primary vaccination between the ages of 2 and 3 months is particularly desirable. The time of vaccination should be adjusted to avoid skin lesions elsewhere on the body, in infants to avoid teething, and in older children to avoid warmer months. Particular care should be used in primary vaccinations beyond the age of infancy.

*Passive*.—None.

(f) *Concurrent disinfection*.—Of all discharges. No article to leave the surroundings of the patient without boiling or equally effective disinfection.

(g) *Terminal disinfection*.—Thorough cleaning and disinfection of premises.

7. *Additional special measures*:

(a) Patients should be removed to isolation hospitals or the entire premises should be under strict quarantine. The strictest attention to aseptic nursing should be used in caring for smallpox patients, and the room and articles possibly contaminated should be thoroughly disinfected on removal, recovery, or death.

(b) Vaccination of infants, preferably by the obstetrician during the first postnatal days, should be encouraged. Vaccination of children should be required before they enter school. Vaccination of employees of establishments exposed to promiscuous public contact and travel should be advocated.

(c) The smallpox vaccine which is to be used in combating an epidemic, or in testing immunity by means of the

7. *Additional special measures*—Continued.

immune reaction, should be obtained direct from the manufacturing laboratory and be kept at or below freezing.

- (d) The more severe the strain of smallpox, the more strictly should preventive recommendations be carried out. In the presence of the severe type full and prompt publicity of the facts and of the proper vaccination procedures should be given to encourage *general vaccination of the public*.

## STREPTOCOCCUS THROAT INFECTIONS

(Septic sore throat, etc.)

1. *Etiological agents*.—*Streptococcus hemolyticus*, human types, especially those similar to streptococci occurring in scarlet fever and septic tonsillitis. For administrative purposes streptococcus throat infections may be divided into three groups on the basis of etiology:

- (a) Epidemic sore throat, which usually occurs in explosive outbreaks and is spread chiefly by milk.  
(b) Scarlatinal sore throat which bacteriologically and epidemiologically has been shown to be due to streptococci of scarlet fever but in which no rash develops.  
(c) Endemic sore throat, tonsillitis, etc., which occurs sporadically and is apparently due to various types of hemolytic streptococci.

1a. *Diagnostic criteria*:

- (a) *Clinical*.—Inflammation and swelling of tonsils and glands of neck, with fever, prostration, and symptoms of a virulent infection.  
(b) *Laboratory*.—Smears and cultures from throat showing causative organism; repeated bacteriological examinations of samples of suspected milk should be made. The obtaining of the necessary proof is often impossible.

2. *Source of infection*.—The human nasopharynx, any case of acute streptococcus inflammation of the throat being a potential source of infection, including the period of convalescence of such cases. The udder of a cow infected by the milker is a common source of infection. In such udders the physical signs of mastitis may be absent.<sup>1</sup>

<sup>1</sup> Mastitis in the cow, due to bovine types of streptococci, is not a cause, so far as known, of septic sore throat in humans unless a secondary infection of the udder by a human type of streptococcus takes place.

3. *Mode of transmission*.—Direct or indirect human contact; consumption of milk, usually raw, contaminated by case or carrier or from an infected individual.
4. *Period of incubation*.—One to three days.
5. *Communicability—Period*.—In man from the onset of infection and during the continuance of clinical symptoms and so long as the specific streptococci persist in the throat. A carrier condition may follow clinical recovery. In the cow, so long as the specific streptococci are discharged in the milk. Any cow discovered to be infected should be excluded from the milking herd.
- 5a. *Statistical epidemiology*:
  - (a) *Prevalence*.—Usually occurs in epidemics and may occur in any part of the country.
  - (b) *Age and sex distribution*.—The groups using raw milk; most cases among adolescents.
  - (c) *Racial and geographical distribution*.—No differentiation.
  - (d) *Seasonal distribution*.—Most epidemics have occurred in the spring or early summer, though they might occur at any time.
  - (e) *Cyclical distribution*.—None.
  - (f) *Mortality and fatality*.—The mortality as a whole is not high, but when epidemics occur the fatality rate is usually fairly high, averaging from 2 to 5 percent.
6. *Administrative measures*:
  - (a) *Investigation of source of infection—Carriers*.—Particularly convalescent carriers are important agents in spreading the disease and all known or suspected carriers should be under observation and be excluded from the handling of milk.
  - (b) *Isolation*.—Modified isolation of the patient during the clinical course of the disease and while he remains a carrier, particularly exclusion from the handling of milk.
  - (c) *Quarantine*.—None.
  - (d) *Specific therapy*.—None.
  - (e) *Specific prophylaxis*.—None.
7. *Additional special measures*:
  - (a) *Pasteurization of all milk supplies*.
  - (b) In the presence of an epidemic, exclusion of the suspected milk supply from use or public sale until pasteurized or until beyond suspicion. Where well-equipped laboratory facilities are available, by



7. *Additional special measures*—Continued.

repeated individual bacteriological examinations it may be possible to detect the infected animal. It may be necessary to have separate samples taken from each quarter of the udder of suspected animals.

- (c) Search for and exclusion of human cases of carriers from the handling of milk or milk products.
- (d) Education in personal hygiene and avoidance of the use of common towels and drinking and eating utensils.

## TETANUS AND OTHER WOUND INFECTIONS

## TETANUS

1. *Etiological agent*.—Tetanus bacillus; *Clostridium tetani*.
- 1a. *Diagnostic criteria*.—Clinical symptoms confirmed by bacteriological examination and mouse inoculation.
2. *Source of infection*.—Animal manure, soil, and street dust.
3. *Mode of transmission*.—Inoculation, or wound infection.
4. *Period of incubation*.—Four days to three weeks, or longer if latent bacilli deposited in the tissues are stirred to activity by subsequent chemical or mechanical irritation; commonly 8 to 10 days.
5. *Statistical epidemiology*.—The disease is world-wide and occurs chiefly as a result of wound infection; more males become infected than females and most cases occur among young children and young people and during the summer months in the United States. The disease is comparatively uncommon but tetanus of the new-born and tetanus untreated with antitetanic serum are highly fatal.
6. *Administrative measures*:
  - (a) *Investigation of sources of infection*.
  - (b) *Isolation*.—None.
  - (c) *Quarantine*.—None.
  - (d) *Specific therapy*.—Antitoxin may help; usually it is of little therapeutic value.
  - (e) *Immunization*.—An attack of the disease does not confer immunity. Passive immunization may be developed promptly by one, or preferably two injections of 1,500 units of tetanus antitoxin.
  - (f) *Concurrent disinfection*.—Destruction of all wound dressings.
  - (g) *Terminal disinfection*.—None.
7. *Additional special measures*:
  - (a) Supervision of the practice of obstetrics.

7. *Additional special measures—Continued.*

- (b) Educational propaganda, such as "safety-first" campaigns, and "safe and sane Fourth of July" campaigns. Education of the public and physicians in infected areas regarding the prevention of the disease and the local treatment of wounds.
- (c) Prophylactic use of tetanus antitoxin in all powder burns, and soiled, ragged, or penetrating wounds, and in wounds of other types acquired in localities where soil is known to be heavily contaminated with *B. tetani*.
- (d) Removal of all foreign matter as early as possible from all wounds.
- (e) Avoidance of the use of bunion pads and shields or other dressings as coverings for vaccinations performed against smallpox.

## TRACHOMA

1. *Etiological agent.*—Undetermined.1a. *Diagnostic criteria:*

- (a) *Clinical symptoms.*

- (b) *Laboratory.*—Bacteriological examination of the conjunctival secretions and lesions may exclude other infections.

2. *Source of infection.*—Secretions and purulent discharges from the conjunctivae of infected persons.3. *Mode of transmission.*—By direct contact with infected persons and indirectly by contact with articles freshly soiled with the infective discharges of such persons.4. *Period of incubation.*—Undetermined.5. *Communicability:*

- (a) *Period and degree of.*—Communicable while lesions are present other than cicatricial. Degree of communicability depends on intimacy of contact and freshness of virus.

- (b) *Immunity—Natural.*—Natural immunity is relative and limited to colored races. *Acquired:* Not known.

5a. *Statistical epidemiology:*

- (a) *Prevalence.*—Present in some immigrants and in certain areas of the United States. The disease creates a problem among American Indians.

- (b) *Age and sex distribution.*—Not restricted as to age or sex, but most cases occur among children.

- (c) The serious aspect of trachoma is not its mortality rate, which is nil, but the impairment to eyesight, or blindness, which may result.

6. *Administrative measures:*

- (a) *Investigation of source of infection—Carriers.*—There are no known carriers, but supposedly healed cases that are not recognizable clinically may have a recurrence and become a source of infection.
- (b) *Isolation.*—Exclusion of the patient from general school classes. Isolation of case is not always necessary if properly treated and instructed.
- (c) *Quarantine.*—None.
- (d) *Specific therapy.*—None.
- (e) *Specific prophylaxis.*—None.
  - Individual.*—Use of zinc sulphate 1 percent, copper sulphate 0.5 percent, novocaine 2 percent.
  - School.*—Special classes and regular treatment of cases.
  - Home.*—Hygienic cleanliness in infected homes, with a mild collyrium in cases of exposure.
- (f) *Concurrent disinfection.*—Of discharges and articles soiled therewith.
- (g) *Terminal disinfection.*—None.

7. *Additional special measures:*

- (a) Search for cases by examination of immigrants, and in trachomatous areas of school children, inmates of orphanages, homes for the indigent, and industries where employees are in close contact (such as lumber camps, construction camps, and where individual toilet articles are not provided).
- (b) Treatment of all cases made easily available and every infected person urged to take treatment.
- (c) Elimination of common towels and toilet articles from public places. Washing should be generally possible in running water, without having to touch faucet or stopper.
- (d) Education in the principles of personal cleanliness and the necessity of avoiding direct or indirect transference of body discharges.
- (e) Provision of dispensaries and clinics where treatment may be conveniently obtained at low cost.
- (f) In endemic centers routine administration of zinc or copper sulphate is a measure of prophylaxis.

## TRICHINIASIS

1. *Etiological agent.*—*Trichinella spiralis*.
- 1a. *Diagnostic criteria:*
  - (a) *Clinical.*—History of eating pork associated with clinical symptoms.
  - (b) *Laboratory.*—Eosinophilia, isolation of parasite in stomach washings or in feces, presence of parasite in portions of unconsumed meat; as last resort, after about 21 days, harpooning of muscles to find parasite.
2. *Source of infection.*—Unsafeguarded (especially uncooked) pork; in rare cases meat of other mammals.
3. *Mode of transmission.*—Direct from meat to man through consumption of infected meat.
4. *Period of incubation.*—Variable from several hours to several weeks.
5. *Communicability.*—Not applicable; no natural or acquired immunity known.
6. *Administrative measures:*
  - (a) *Investigation of sources of infection—Carriers.*—None in man.
  - (b) *Isolation.*—None.
  - (c) *Quarantine.*—None.
  - (d) *Specific therapy.*—None.
  - (e) *Immunization.*—None.
  - (f) *Concurrent disinfection.*—None.
  - (g) *Terminal disinfection.*—None.
7. *Additional special measures:*
  - (a) Thorough cooking, or curing of meat. (Thermal death point of parasite 131° F.)
  - (b) Refrigeration of meat at 5° F. for 20 days.
  - (c) Extermination of rats, especially around meat shops and slaughterhouses and hog pens.
  - (d) Cooking of swill and offal to be fed to hogs.
  - (e) Microscopical inspection of pork unreliable and frequently misleading.

## TULAREMIA

1. *Etiological agent.*—*Bacterium tularense*; *Pasteurella tularensis*.
- 1a. *Diagnostic criteria:*
  - (a) *Clinical symptoms.*
  - (b) *Laboratory.*—Animal inoculation and agglutination reactions.

2. *Source of infection.*—Wild rabbits and hares, horsefly (*Chrysops discalis*), wood tick (*Dermacentor andersoni* and *Dermacentor variabilis*) woodchuck, coyote, muskrat, opossum, tree squirrel, quail, skunk, and water rat of Europe (*Arvicola amphibius*).
3. *Mode of transmission.*—By bites of infected flies and ticks and by inoculation through handling infected animals as in skinning, dressing, or performing necropsies on infected animals, or by fluids from infected flies, ticks, rabbits, and woodchucks. Rare cases occur from bites of coyotes, skunks, and hogs where the mouth of the animal was presumably contaminated from eating infected rabbits.
4. *Period of incubation.*—From 24 hours to 10 days, average slightly more than 3 days.
5. *Communicability.*—There is no authentic record of transfer of the disease from man to man. The infection has been found in the blood during the first 2 weeks; in conjunctival scrapings up to 17 days; in the primary lesion on the finger up to 17 days; in the sputum on the twelfth day; in lymph glands up to 53 days; in ascitic fluid (taken during life) 3 months after onset; in the spleen taken at autopsy up to 26 days. Flies are infective for 14 days, ticks throughout their lifetime. Refrigerated rabbits may remain infective for 3 months, but not for 4 months.
6. *Administrative measures:*
  - (a) *Investigation of source of infection.*
  - (b) *Isolation.*—None.
  - (c) *Quarantine.*—None.
  - (d) *Specific therapy.*—None.
  - (e) *Specific prophylaxis.*—None.
  - (f) *Concurrent disinfection.*—Disinfection of discharges from the ulcer, lymph glands, or conjunctival sac.
  - (g) *Terminal disinfection.*—None.
7. *Additional special measures:*
  - (a) Avoidance of the bites or handling of flies and ticks when working in the infected zones during the seasonal incidence of blood-sucking flies and ticks.
  - (b) The use of rubber gloves by persons engaged in dressing wild rabbits, wherever taken, or when performing necropsies on infected laboratory animals. Employment of immune persons for dressing wild rabbits or conducting laboratory experiments. Thorough cooking of meat of wild rabbits. Refrigeration of wild rabbits for 3 months previous to dressing them.

## TYPHOID FEVER

1. *Etiological agent*.—Typhoid bacillus, *Eberthella typhi*.
- 1a. *Diagnostic criteria*:
  - (a) Clinical symptoms confirmed by
  - (b) Specific agglutination test and bacteriological examination of blood, bowel discharges, or urine.
2. *Source of infection*.—Bowel discharges and urine of infected persons and carriers, infrequently by sputum. Healthy carriers are a common cause of outbreaks.
3. *Mode of transmission*.—Conveyance of the specific organism by direct or indirect contact with a source of infection. Among indirect means of transmission are contaminated water, milk, and shellfish, and other foodstuffs. Contaminated flies may be a means of transmitting the disease.
4. *Period of incubation*.—From 7 to 23 days, averaging 10 to 14 days.
5. *Communicability—Period*.—From the appearance of prodromal symptoms, and occasionally before, throughout the illness and relapses during convalescence, and until repeated bacteriological examinations of the discharges show persistent absence of the infecting organism.
6. *Administrative measures*:
  - (a) *Investigation of sources of infection—Carriers*.—Carriers constitute a serious problem in the control of typhoid fever, as individuals may carry the typhoid bacillus for long periods and exhibit no symptoms of the disease. The control consists in their discovery, in their being placed under observation by the health department, in their agreeing to refrain from occupations of food or milk handling, and to observe special sanitary care to prevent transfer of the causative agents.
  - (b) *Isolation*.—In flyproof room, preferably under hospital conditions, of such cases as cannot command adequate sanitary environment and nursing care in their homes. Release from isolation should be determined by at least two successive negative cultures of stool and urine specimens collected not less than 24 hours apart.
  - (c) *Quarantine*.—None.
  - (d) *Specific therapy*.—None.
  - (e) *Immunization*.—Of susceptibles in the family or household of the patient who have been exposed and of those who by residence, travel, or occupation are likely to be exposed to the disease.

6. *Administrative measures*—Continued.
  - (f) *Concurrent disinfection*.—Disinfection of all bowel and urinary discharges and articles soiled with them.
  - (g) *Terminal disinfection*.—Cleaning.
7. *Additional special measures*:
  - (a) Protection and purification of public water supplies.
  - (b) Pasteurization of public milk supplies.
  - (c) Supervision of other food supplies and of food handlers.
  - (d) Prevention of fly breeding.
  - (e) Sanitary disposal of human excreta.
  - (f) Extension of immunization by vaccination, as far as practicable, in communities where the disease is prevalent.
  - (g) Supervision of typhoid carriers and their exclusion from the handling of foods.
  - (h) Systematic examination of fecal specimens from those who have been in contact with recognized cases to detect carriers.
  - (i) Persons who fail to show a strongly positive Widal reaction and contemplate traveling should protect themselves by vaccination.
  - (j) Exclusion of suspected milk supplies pending discovery of the person or other cause of contamination of the milk.
  - (k) Exclusion of water supply, if contaminated, until adequately treated with hypochlorite or other efficient disinfectant, or unless all water used for toilet, cooking, and drinking purposes is boiled before use.

#### TYPHUS FEVER

1. *Etiological agent*.—*Rickettsia prowazeki* is believed to be the causative agent.
2. *Source of infection*.—The only known source is the blood of infected individuals in recognized or missed cases.
3. *Mode of transmission*.—Infectious agent transmitted by lice (*Pediculus corporis*, *P. capitis*). The possibility of transmission by some other acaroid as a tick or a mite has been suggested by recent epidemiological data.
4. *Period of incubation*.—Five to twenty days, usually 12 days.
5. *Communicability—Period*.—Until 36 hours have elapsed after the temperature reaches normal.
6. *Administrative measures*.
  - (a) *Investigation of sources of infection*.
  - (b) *Isolation*.—In a vermin-free room. All attendants should wear vermin-proof clothing.

6. *Administrative measures*.—Continued.

- (c) *Quarantine*.—Exposed susceptibles for 14 days after last exposure.
- (d) *Specific therapy*.—None.
- (e) *Immunization*.—Methods for immunization not generally accepted.
- (f) *Concurrent disinfection*.—None.
- (g) *Terminal disinfection*.—Destroy all vermin and vermin eggs on body of patient, if not already accomplished. Destroy all vermin and eggs on clothing. Rooms to be rendered free from vermin.

7. *Additional special measures*.—Delousing of persons, clothing, and premises during epidemics, or when they have come or have been brought into an uninfected place from an infected community.

## UNDULANT (MALTA) FEVER

(Brucelliasis)

1. *Etiological agent*.—*Micrococcus melitensis*, *Brucella melitensis*, *Bacillus abortus*, *Brucella suis*.1a. *Diagnostic criteria*.

- (a) *Clinical*.—Irregular fever of uncertain duration, profuse sweating, chills (or chilliness), pain in joints and muscles.
- (b) *Laboratory*.—Agglutination test. Culture of etiological agent from blood, tissues, or discharges of patient.

2. *Source of infection*.—The milk of infected cows, goats, and other infected mammals; the urine of infected goats and probably that of other infected domestic animals; the discharges from the genital tract and expelled uterine contents of aborting infected animals; the carcasses and by-products of slaughtered infected animals; possibly the feces of infected domestic animals and the feces and urine of infected persons.3. *Mode of transmission*.—By ingestion of the milk from infected animals; by direct contact with infected livestock and the discharges from the genital tract of infected females; by inoculations through abrasions of the skin or conjunctiva; by inoculation through the unbroken skin or conjunctiva; by contact with blood, organs, or carcasses of slaughtered infected animals.4. *Period of incubation*.—Minimum 6 days; maximum unknown; average 15 to 30 days.5. *Communicability*.—Communicability from person to person rarely, if ever, takes place.



5. *Communicability*—Continued.

*Immunity*.—Most persons have considerable natural immunity (especially to the abortus varieties of the etiological agent), or may acquire some immunity by ingestion of small doses of the casual organism. Experimental work on laboratory animals indicates that an attack of the disease confers immunity.

6. *Administrative measures*:

- (a) *Investigation of sources of infection—Carriers*.—No “carrier problem” has yet arisen. Disinfection of infectious discharges of carriers and prohibition of the carriers from engaging in cooking, food handling, and so forth.
- (b) *Isolation*.—None.
- (c) *Quarantine*.—None.
- (d) *Specific therapy*.—None of proven value.
- (e) *Immunization—Prophylaxis*.—No specific immunologic prophylaxis has proven satisfactory. Prophylactic measures: Pasteurization of milk; examination of livestock to determine infected animals and elimination of same from herd, either by slaughter or segregation of infected animals; education of public and particularly of persons working in slaughterhouses, meat-packing establishments, and butcher shops, as to the nature of the disease and danger of contracting same from handling carcasses of infected slaughtered animals.
- (f) *Concurrent disinfection*.—Is advisable though the disease rarely, if ever, is transferred from person to person.

7. *Additional special measures*:

- (a) Sterilization of goat's milk.
- (b) Report infected, or suspicious, livestock to proper veterinary authorities.
- (c) Cooperate with agricultural, veterinary, or other officials and with livestock owners in eradication of disease from livestock.

## VINCENT'S ANGINA

1. *Etiological agent*.—*Bacillus fusiformis* (*Fusiformis dentium*).

1a. *Diagnostic criteria*:

- (a) *Clinical*.—Ultero-membranous inflammation showing yellowish gray exudate easily removed, leaving a raw bleeding surface and later a punched-out appearance;

1a. *Diagnostic criteria*—Continued.

slight temperature; pain on swallowing; enlarged and tender lymph nodes. The most marked feature is a peculiar redness. The condition might be called erysipelas of the mouth.

- (b) *Laboratory*.—Spreads show many straight or slightly curved rods, with tapering ends, mostly gram negative with faintly staining granules. Usually accompanied by many spirochetes (*Borrelia vincenti*) whose role in the disease is not yet determined. Both are anaerobes.

2. *Source of infection*.—Discharges from lesions and from carriers.

3. *Mode of transmission*.—Direct contact with patient or carrier.

4. *Period of incubation*.—Variable.

5. *Communicability*:

(a) *Period and degree of*.—As long as the bacillus is present; slight degree of communicability.

(b) *Natural and acquired immunity*.—Not determined but no specific acquired immunity evident.

5a. *Statistical epidemiology*:

(a) *Prevalence*.—Incidence low; higher in undernourished and in those having diseased teeth.

(b) *Age and sex distribution*.—Comparatively higher in children.

6. *Administrative measures*:

(a) *Investigation of sources of infection*.

(b) *Isolation*.—Active cases not under treatment should be isolated without quarantine. Children may attend school if under treatment and if proper precautions are taken to prevent transfer of the disease to other children.

(c) *Quarantine*.—None.

7. *Additional special measures*:

(a) Strict oral hygiene. Sodium perborate seems to be the most specific for prevention and treatment.

(b) Adequate treatment should be provided or enforced.

## WHOOPING COUGH

1. *Etiological agent*.—In all probability *pertussis bacillus* of Bordet and Gengou, *Hemophilus pertussis*.

1a. *Diagnostic criteria*:

(a) *Clinical*.—Development of characteristic paroxysmal cough.

1a. *Diagnostic criteria*—Continued.

- (b) *Laboratory*.—Lymphocytosis; bacteriological examination by cough plate method is impracticable as a routine.
- 2. *Source of infection*.—Discharges from the laryngeal and bronchial mucous membranes of infected persons.
- 3. *Mode of transmission*.—Contact with an infected person or with articles freshly soiled with the discharges of such person.
- 4. *Period of incubation*.—Commonly 7 days, almost uniformly within 10 days and not exceeding a 16-day maximum.
- 5. *Communicability*:
  - (a) *Period and degree of*.—Readily communicable. Particularly communicable in the early catarrhal stages before the characteristic whoop makes a clinical diagnosis possible. The catarrhal stage occupies from 7 to 14 days. After the characteristic whoop has appeared the communicable period continues, probably for 3 weeks. Even if the spasmodic cough with whoop persists longer than this, it is most unlikely that the infecting organism can be isolated from the discharges. The communicable stage must be considered to extend from 7 days after exposure to an infected individual to 3 weeks after the development of the characteristic whoop.
  - (b) *Immunity*.—*Natural*: Little or no immunity in early infancy. *Acquired*: A high degree of immunity is conferred by an attack. Immunity increases with age, presumably due to larvate attacks which are quite common in older children and in adults. The immunizing value of whooping cough vaccine is doubtful both as to degree and duration.
- 6. *Administrative measures*:
  - (a) *Investigation of sources of infection—Carriers*.—True carriers (i.e., individuals having no cough or other symptoms) are not known to exist. Many supposedly susceptible contacts, however, fail to show any characteristic symptoms and probably an appreciable percentage of these are individuals who have previously had an atypical attack. No effective way of discovering or handling these is known.
  - (b) *Isolation*.—Because of the long period of communicability, isolation of cases is impracticable except in children up to 2 years old. Isolation should be advised to reduce chances of picking up secondary infections

6. *Administrative measures*—Continued.

but never at the expense of fresh air or open air if weather permits.

(c) *Quarantine*.—None, except in institutions.

(d) *Specific therapy*.—Vaccine treatment of doubtful value. No other specific therapy.

(e) *Immunity*.—For active, use of vaccine doubtful; no passive.

(f) *Concurrent disinfection*.—Discharges from the nose and throat of the patient and articles soiled with such discharges.

7. *Terminal disinfection*.—Cleaning.**HEALTH OF THE NAVY**

The admission rate for all causes, entire Navy, based on returns for April, May, and June 1933, was 470 per 1,000 per annum. The rate for the corresponding months of 1932 was 521, which was also the median for this quarter for the preceding 5 years. The rate for the second quarter of 1933 was 33 percent higher than the rate for the first quarter of the year. The admission rate for disease was 407 per 1,000 per annum, which is a little less than the expected rate, 470. An increase occurred in admissions for injuries. The rate for the quarter under discussion was 62 per 1,000 per annum, which was a 22 percent increase over the rate for the corresponding quarter of 1932 and a 77 percent increase over the rate for the first quarter of 1933. This increase was caused by the crash of the *Akron* resulting in 72 fatal injuries. Poisonings increased from 0.44 per 1,000 per annum for the first quarter of 1933 to 1.51 per 1,000 for April, May, and June. The median or expected rate for the corresponding quarter of the previous 5 years is 0.36 per 1,000.

Only 364 cases of acute respiratory diseases were reported by shore stations in the United States during the second quarter of the year, which is far below expectancy for this quarter. As usual, catarrhal fever caused the majority of the admissions. The United States naval training station, Norfolk, Va., reported 65 cases; United States naval training station, Newport, R.I., 30; United States naval training station, San Diego, Calif., 28; United States marine barracks, Quantico, Va., 18; and the United States Marine Corps base, San Diego, Calif., 17. The United States naval training station, Norfolk, Va., also reported that cases of German measles continued to be admitted, 11 cases appearing in April. Monthly sanitary reports from naval training stations contained statements to the effect that the health of the station personnel for the quarter has been good and

noted very few admissions for diseases other than those mentioned above.

The admission rate, all causes, for forces afloat, was 424 per 1,000 per annum for the quarter, as compared with 292 per 1,000, the rate for the first quarter of the year, and 457, the corresponding median rate for the preceding 5 years. Although a reduction in the admission rates for communicable diseases and venereal diseases was noted, the general admission rate for all diseases was higher than the rate for the first quarter. This was due to an increase in admissions for class X (malaria) and class III (appendicitis, acute gastroenteritis, acute gastritis, and acute cholangitis). One case of cerebrospinal fever occurred on board the U.S.S. *West Virginia* in April. Two cases of scarlet fever were notified by forces afloat during the quarter—one from the U.S.S. *Wyoming* in May and one from the U.S.S. *Chester* in June.

Forty-six cases of mumps were reported from the Fourth Marines, Shanghai, China.

TABLE 1.—*Summary of morbidity in the United States Navy for the quarter ended June 30, 1933*

	Forces afloat		Forces ashore		Entire Navy	
	Admissions	Annual rate per 1,000	Admissions	Annual rate per 1,000	Admissions	Annual rate per 1,000
Average strength.....	73, 151		35, 220		108, 371	
All causes.....	7, 761	424.38	4, 974	564.91	12, 735	470.05
Disease only.....	6, 743	368.72	4, 281	486.20	11, 024	406.90
Injuries.....	985	53.86	685	77.80	1, 670	61.64
Poisonings.....	33	1.80	8	.91	41	1.51
Communicable diseases, exclusive of venereal diseases:						
Class VIII (A).....	289	15.80	201	22.83	490	18.09
Class VIII (B).....	1, 172	64.09	868	95.58	2, 040	75.30
Venereal diseases.....	2, 026	110.78	696	79.05	2, 722	100.47

TABLE 2—Deaths reported, entire Navy, during the quarter ended June 30, 1933

Cause—Disease		Navy			Marine Corps		Nurse Corps	Total
Primary	Secondary or contributory	Officers	Midshipmen	Men	Officers	Men		
Average strength.....		9,293	1,514	80,611	1,178	15,295	480	108,371
Abcess, brain.....	Hemorrhage, cerebral.....			1				1
Do.....	Pleurisy, suppurative.....			1				1
Anaphylaxis (tetanus).....	None.....			1				1
Aneurysm:								
Anterior cerebral artery.....	Hemorrhage, cerebral.....			1				1
Aorta.....	Rupture, traumatic aorta.....					1		1
Appendicitis:								
Acute.....	Peritonitis, general, acute.....		1			1		2
Chronic.....	Peritonitis, local, acute.....					1		1
Carcinoma:								
Bladder.....	None.....			1				1
Prostate.....	Pneumonia, broncho.....	1						1
Cellulitis, leg.....	Septicemia.....			1				1
Hernia, ventral (post-operative).....	Dilatation, cardiac, acute.....			1				1
Hemorrhage, cerebral.....	Arterial hypertension.....			1				1
Leukemia.....	None.....					1		1
Myocarditis, acute.....	Dilatation, cardiac, acute.....					1		1
Nephritis:								
Acute.....	Arterial hypertension.....			1				1
Chronic.....	None.....	1						1
Pachymeningitis, cerebral.....	None.....					1		1
Pancreatitis, acute.....	None.....			1				1
Pneumonia, lobar.....	None.....			1				1
Do.....	Pleurisy, suppurative.....			1				1
Rheumatic fever.....	Endocarditis, acute.....			1				1
Sarcoma:								
Abdominal.....	None.....			1				1
Cervical.....	None.....			1				1
Inguinal.....	None.....	1						1
Thrombosis, coronary.....	None.....	1		1	1			3
Syphilis.....	Poisoning, neoarsphenamine, acute.....			1				1
Tuberculosis, pulmonary, chronic.....	Hemorrhage, pulmonary.....			1				1
Do.....	Tuberculosis, intestines.....			3				3
Tuberculosis, pulmonary, chronic.....	Tuberculosis, meninges.....			1				1
Do.....	Pneumonia, lobar.....			1				1
Do.....	Septicemia.....			1				1
Total for diseases.....		4	1	24	1	6	0	36
INJURIES AND POISONINGS								
Avulsion, head.....	None.....			3		1		4
Crush.....	None.....			1				1
Drowning.....	None.....			1				1
Fracture:								
Compound, skull.....	None.....			5				5
Do.....	Hemorrhage, intracranial.....			1		2		3
Do.....	Fracture, vertebra, cervical.....			3				3
Simple, skull.....	None.....			1		1		2
Do.....	Meningitis, spinal.....			1				1
Do.....	Rupture, traumatic, liver.....			2				2
Do.....	Wound, lacerated, lung and liver.....					1		1
Pelvis.....	Rupture, traumatic, kidney.....			1				1
Vertebrae, cervical.....	None.....			1				1
Do.....	Carcinoma, lung.....			1				1
Injuries, multiple, extreme.....	None.....	3		2				5
Do.....	Meningitis, cerebrospinal.....			1				1
Strangulation, neck.....	None.....			2				2
Wound, gunshot.....								
Aorta.....	Hemorrhage, traumatic, aorta.....			1				1
Head.....	None.....	1		2		1		4
Heart.....	None.....					1		1

TABLE 2.—Deaths reported, entire Navy, during the quarter ended June 30, 1933—Continued

Cause—Disease		Navy			Marine Corps		Nurse Corps	Total
Primary	Secondary or contributory	Officers	Midshipmen	Men	Officers	Men		
INJURIES AND POISONINGS—continued								
Poisoning, acute:								
Alcohol, methyl.....	None.....			1				1
Anaesthesia (novocaine).....	Appendicitis, acute.....			1				1
Hydrocyanic acid.....	None.....	1						1
Shell cleaning fluid.....	None.....			1				1
INJURIES, U.S.S. "AKRON"								
Exhaustion from overexposure.....	None.....			1				1
Drowning.....	None.....	1						1
Intracranial injury.....	None.....	4		1				5
Injuries, multiple, extreme.....	None.....	13		54				67
Total for injuries and poisonings.....		23	0	88	0	7	0	118
Grand total.....		27	1	112	1	13	0	154
Annual death rate per 1,000:								
All causes.....		11.62	2.64	5.56	3.40	3.40		5.68
Disease only.....		1.72	2.64	1.19	3.40	1.57		1.33
Drowning.....		.43		.05				.07
Other injuries.....		9.04		4.17		1.83		4.13
Poisonings.....		.43		.15				.15

## ADMISSIONS FOR INJURIES AND POISONINGS, SECOND QUARTER, 1933

The following table, indicating the frequency of occurrence of accidental injuries and poisonings in the Navy during the second quarter, 1933, is based upon all form F cards covering admission in those months which have reached the bureau:

	Admissions April, May, and June 1933	Admission rate per 100,000 per annum	Admission rate per 100,000, year 1932
INJURIES			
Connected with work or drill.....	705	2,602	2,440
Occurring within command but not associated with work.....	413	1,524	1,675
Incurred on leave or liberty or while absent without leave.....	552	2,037	1,900
All injuries.....	1,670	6,164	6,015
POISONINGS			
Industrial poisonings.....	10	37	8
Occurring within command but not connected with work.....	21	77	68
Associated with leave, liberty, or absence without leave.....	10	37	17
Poisonings, all forms.....	41	151	93
Total injuries and poisonings.....	1,711	6,315	6,108

## PERCENTAGE RELATIONSHIPS

	Occurring within command				Occurring out- side command	
	Connected with the performance of work, drill, etc.		Not connected with work or prescribed duty		Leave, liberty, or a.w.o.l.	
	April, May, and June 1933	Year 1932	April, May, and June 1933	Year 1932	April, May, and June 1933	Year 1932
Percent of all injuries.....	42.2	40.6	24.7	27.8	33.1	31.6
Percent of poisonings.....	24.4	8.7	51.2	72.8	24.4	18.5
Percent of total admissions, injury and poisoning titles.....	41.8	40.1	25.4	28.5	32.8	31.4

Poisoning by a narcotic drug or by ethyl alcohol is recorded under the title "Drug addiction" or "Alcoholism", as the case may be. Such cases are not included in the above figures.

There were no cases during the second quarter of 1933 worthy of notice from the standpoint of accident prevention.

## STATISTICS RELATIVE TO MENTAL AND PHYSICAL QUALIFICATIONS OF RECRUITS

The following statistics were compiled from the monthly sanitary reports submitted by naval training stations:

April, May, and June 1933	United States Naval Training Station			
	Hamp- ton Roads, Va.	Great Lakes, Ill. <sup>1</sup>	San Diego, Calif.	New- port, R. I.
Recruits received during the period.....	116	170	202	115
Recruits appearing before Board of Medical Survey.....	5	1	1	0
Recruits recommended for discharge from the service.....	5	1	1	0
Recruits discharged by reason of medical survey.....	7	( <sup>2</sup> )	( <sup>2</sup> )	0
Recruits held over pending further observation.....	0	0	0	0
Recruits transferred to the hospital for treatment, operation, or further observation for conditions existing prior to enlistment.....	1	0	16	7

<sup>1</sup> Figures for April and May. The Naval Training Station was decommissioned on June 20.

<sup>2</sup> Not given.

The following table was prepared from reports of medical surveys in which disabilities or disease causing the surveys were noted as existing prior to enlistment. The time which elapsed from date of enlistment to date of medical survey is noted in each case. With certain diseases, survey followed enlistment so rapidly that it would seem that many might have been eliminated in the recruiting office. The difficulty in establishing a diagnosis in nervous and mental cases is demonstrated by the time interval in the table. An exception in



this group is epilepsy which may or may not diagnose itself promptly. Certain groups, of course, present difficulties in diagnosis at the time of enlistment due to lack of equipment:

Cause of survey	Number of surveys	Number of days between enlistment and survey
Adhesions, abdominal.....	1	42
Caries, teeth.....	1	210
Do.....	1	14
Do.....	1	13
Constitutional psychopathic inferiority, without psychosis.....	1	42
Do.....	1	35
Do.....	1	19
Deafness, bilateral.....	1	5
Dementia praecox.....	1	60
Eczema.....	1	17
Enuresis.....	1	162
Do.....	1	149
Flat foot.....	1	79
Gonococcus infection, urethra.....	1	140
Insufficiency, ocular muscle.....	1	8
Otitis, media, chronic.....	1	96
Syphilis.....	1	7
Ulcer, duodenum.....	1	55

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APRIL 1934

No. 2

# UNITED STATES NAVAL MEDICAL BULLETIN

PUBLISHED QUARTERLY FOR THE INFORMATION OF  
THE MEDICAL DEPARTMENT OF THE NAVY



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NAVY DEPARTMENT,  
*Washington, March 20, 1907.*

This UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the Department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,  
*Acting Secretary.*

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Owing to the exhaustion of certain numbers of the BULLETIN and the frequent demands from libraries, etc., for copies to complete their files, the return of any of the following issues will be greatly appreciated:

Volume IX, no. 1, January 1915.  
Volume X, no. 2, April 1916.  
Volume XI, no. 3, July 1917.  
Volume XII, no. 1, January 1918.  
Volume XII, no. 3, July 1918.

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## PREFACE

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The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April 1907 as a means of supplying medical officers of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine, descriptions of suggested devices, clinical notes on interesting cases, editorial comment on current medical literature of special professional interest to the naval medical officer, and reports from various sources, notes, and comments on topics of medical interest.

The Bureau extends an invitation to all medical and dental officers to prepare and forward, with a view to publication, contributions on subjects of interest to naval medical officers.

In order that each service contributor may receive due credit for his efforts in preparing matter for the BULLETIN of distinct originality and special merit, the Surgeon General of the Navy will send a letter of commendation to authors of papers of outstanding merit.

The Bureau does not necessarily undertake to endorse all views or opinions which may be expressed in the pages of this publication.

P. S. ROSSITER,  
*Surgeon General, United States Navy.*

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Contributions to the BULLETIN should be typewritten, *double spaced*, on plain paper, and should have wide margins. Fasteners which will not tear the paper when removed should be used. Nothing should be written in the manuscript which is not intended for publication. For example, addresses, dates, etc., not a part of the article, require deletion by the editor. The BULLETIN endeavors to follow a uniform style in heading and captions, and the editor can be spared much time and trouble, and unnecessary changes in manuscript can be obviated if authors will follow in these particulars the practice of recent issues.

The greatest accuracy and fullness should be employed in all citations, as it has sometimes been necessary to decline articles otherwise desirable because it was impossible for the editor to understand or verify references, quotations, etc. The frequency of gross errors in orthography in many contributions is conclusive evidence that authors often fail to read over their manuscripts after they have been typewritten.

Contributions must be received 2 months prior to the date of the issue for which they are intended.

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The BULLETIN intends to print *only original articles, translations, in whole or in part, reviews, and reports and notices of Government or departmental activities, official announcements, etc.* All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without an understanding to that effect.

# U.S. NAVAL MEDICAL BULLETIN

VOL. XXXII

APRIL 1934

No. 2

## SPECIAL ARTICLES

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### X-RAY ORGANIZATION AND PROBLEMS IN THE UNITED STATES NAVY

By IRVING W. JACOBS, Lieutenant Commander, Medical Corps, United States Navy

*History and development.*—Prior to the World War the X-ray laboratories of our naval hospitals were rather insignificant features in the general organization of our institutions. As there was no definite X-ray officer in charge, this work was supervised by a commissioned naval medical officer, usually a surgeon, but in some instances a pharmacist or chief pharmacist's mate handled the activities of this specialty.

At one of our important naval hospitals the routine was somewhat as follows: The pharmacist made the appointments, radiographed the patient, developed the films, and made the interpretations of pathological conditions after comparing the pictures with others and after looking up X-ray manuals and other books written by physicians. When officers visited the X-ray laboratory they would sometimes make their own interpretations, agreeing or disagreeing with the pharmacist at that time. Of course, the bulk of the work done then was rather simple, such as X-rays of the bones for fractures, films of the sinuses, chest plates, and an occasional gastrointestinal examination. No fluoroscopy nor other special work was usually attempted.

However, the radiographic work in our hospitals at that time compared favorably with that done in the average civilian institution, and our naval medical officers showed great interest in roentgenology.

About 1914, a course in radiology was given at the Naval Medical School. This embraced the elementary theory and practice of this specialty, as it was realized by the commanding officer that the student medical officers, although recruited from the best class A medical schools, needed this necessary instruction.

At the beginning of the World War, many specialists joined the Medical Corps. Among these were doctors who had specialized in radiology in civilian life and who had been in charge of X-ray departments throughout the country. These physicians as far as

possible, were allowed to continue their specialty in the Navy, being assigned as X-ray officers in our hospitals.

After the armistice, it was necessary to replace these civilians with regular Navy medical officers. Therefore, certain members of our corp were given postgraduate courses of instruction at such institutions as Harvard, Pennsylvania, University of California, and the Post-Graduate Hospital in New York. These courses were from 4 to 6 months' duration, which was entirely too short, as only the elementary subjects could be taught during this period. However, a great deal was accomplished, in that, efficient X-ray organizations could be established similar to those in our larger civilian institutions.

*The Specialty of Radiology.*—Radiologists should be thoroughly trained specialists who have had 3 to 5 years' experience in general medicine and surgery. This is of the greatest importance as there is no other specialty which requires greater fundamental knowledge than this one, and no other which is so closely allied to both these branches of medicine. Now that X-ray therapy is playing such an important part in the practice of medical science, it is most desirable and necessary for roentgenologists, especially in the Army and Navy, to have acquired more than the average amount of knowledge of malignancy, tumors, and skin diseases.

As consultants, they are constantly contacted by other members of the staff and must know something of all the specialties to be able to make proper interpretations, render advice, offer suggestions, and be of general service to the other departments in our hospitals. They should master organization and be particularly interested in this feature of the work. All postgraduate courses in X-ray now devote much time to this, as experience has taught the leading radiologists that a department lacking organization, is usually inefficient, regardless of the quality and brains of its personnel. High-priced and intricate equipment which is constantly changing in style, makes it necessary for the roentgenologist to become well acquainted with this subject.

Until recently, an X-ray department was attached to, or combined with, either the medical or surgical services. However, with its increasing importance in work, organization, and special problems concerning personnel and equipment, it is now independent and managed by a chief of department.

The question always arises and will be discussed as to whether or not one or two radiologists should be attached to each naval hospital. If radiology is believed to be of equal importance with medicine and surgery in our hospital organizations, it should receive the same consideration in personnel as these two branches of medicine.

It is believed that two X-ray officers should be attached to our hospitals at all times for the same reason we have two surgeons, two internists, and two eye, ear, nose, and throat specialists.

*Location and adequate space.*—The ideal location for a department of radiology is in the main building, in close proximity to the operating room and the department of urology.

When placed in separate buildings or in the basement as is customary, there is much confusion in the moving of patients to and fro; additional corpsmen are necessary to accomplish this and when elevators are out of order or not running, examination of patients is often postponed or delayed.

After a suitable location is once decided upon, there should be as little change as possible, for experience and history have shown that the moving of X-ray equipment from place to place is a most expensive pastime. It can be recalled that at one of our hospitals, the X-ray department has been moved from the cellar to the second deck, and back to the basement again within a period of several years.

It is believed that the basement is a poor place for any X-ray department because dampness affects electrical apparatus of all kinds, is a direct cause of fluctuating currents with or without stabilization, and if deep therapy is attempted, the quality and quantity of irradiation is constantly changing, a most serious and dangerous matter.

*Adequate space.*—In general, the original space planned for these departments in our hospitals has usually been inadequate, causing confusion, lost motion, and unnecessary expense at a later date when expansion is necessary.

It is much better to have too much space as in this hospital than too little, as it is easy to contract but not always to expand.

*Equipment.*—

- (A) Homogeneous versus heterogeneous types
- (B) Shockproof
- (C) Price and service
- (D) Standard manufacturers
- (E) Combined apparatus
- (F) High energy technique
- (G) Deep therapy

As X-ray equipment is a most important part of any radiological department, it is necessary for the roentgenologists and therapists to become interested in the subject of equipment and X-ray apparatus. He can become well versed in this by writing for pamphlets issued by the large firms and by reading the literature on the subject. Later, by contacting the different concerns and having a

demonstration, he can acquire accurate and practical knowledge of the special characteristics of any individual "make." It is similar to the buying of an automobile and about the same methods are used in selling X-ray equipment.

Manufacturers spend large sums on advertising; they have excellent and shrewd salesmen and naturally radiologists must know thoroughly beforehand what they want; otherwise, they are apt to buy or purchase what the company *wishes* to sell them.

In one instance in a New York civilian hospital the radiologist was entertained royally by the manager of a large concern in order to have the new hospital equipped with units of one "make." Eventually, his firm was given the contract to equip a new hospital with every item of this one company, excluding all others. Consequently, thousands of dollars were expended unnecessarily and certain inferior equipment was installed which had subsequently to be replaced.

Now, all the first-class manufacturing companies have certain apparatus in which they specialize and with which they make their reputations. No one concern excels in all features of equipment; otherwise, the others would go out of business. Therefore, X-ray men can investigate and obtain for their departments the best units of the various companies, based on price, upkeep, service, and durability. If roentgenologists of the Navy would take more time to investigate and recommend the purchase of the best of the different standard manufacturers, our equipment would be definitely improved.

*Homogeneous versus heterogeneous types.*—Several years ago the X-ray officer in one of our larger hospitals had one radiographic machine. It consisted of a Campbell transformer, a Wappler table and a Victor overhead wiring system. Whenever any repair work was indicated, it was necessary to get representatives of the three concerns together into a conference to make a decision. Individually, each blamed the others for the defect, but collectively, the trouble was rapidly diagnosed and eliminated. Possibly, conditions are better today in the Navy but many heterogeneous types of X-ray apparatus still are present in our hospitals. These should be replaced as soon as practicable by the homogeneous type. For example, if the radiographic unit is Westinghouse (Wappler), that company should supply every accessory in that unit—that is, machine, table, and tube stands.

*Shockproof apparatus.*—It is believed that for fluoroscopic examinations shockproof units are necessary for the following reasons:

1. Operator, patients, assistants, and observers are safe and the hazard of electrocution is eliminated.

2. Neurasthenic and psychoneurotic patients may touch any part of the equipment without danger.

3. A good shockproof apparatus gives less mechanical trouble and the life of the machine is longer.

For radiographic examinations, it is believed that shockproof equipment is not absolutely essential. If technicians are thoroughly trained, electrical hazards are minimal in the nonshockproof type, the price is much less, and the quality of the work is far superior to that produced by shockproof radiography.

This hospital had a shockproof radiographic unit costing \$5,800 several years ago, which did not have a capacity of more than 30 ma. It could be used only for bone work and one must admit that the results, even in this type of minor work, were nothing to boast of. For a similar amount of money, the Navy could buy two very good units: (1) Partial shockproof fluoroscope, (2) a high energy valve tube radiographic machine.

*Price and service.*—Most of the large X-ray concerns charge the price of service to the initial cost. Prior to the N.R.A., the Navy received a discount in its purchases from these organizations which gave service free of charge. Now this has been changed, for the "code" eliminates discounts to the Government, forbids free service, and standardizes initial price. Consequently, due to the above conditions and to decreased appropriations, the buying of new equipment in the future will require greater care than ever before.

*Standard manufacturers.*—There are about six standard manufacturers of X-ray apparatus in the United States at this time. All are reliable firms in good ethical standing, and from these practically all equipment could be purchased advantageously. It is not believed a good policy to equip an X-ray department with all the apparatus of one "make", but it seems better to select the best individual units from the different organizations.

*Combined X-ray and fluoroscopic equipment.*—This type is not suitable for our institutions for the following reasons:

1. Expense.
2. Efficiency of the department.
3. Lost motion, changing from radiographic to fluoroscopic conditions and vice versa.
4. Size and space occupied by these "white elephants."

Again it is necessary to state that the one previously in use in this hospital is now in the storeroom, and that the Naval Medical Supply Depot has a similar machine costing \$6,200 which it has been "hoping" to send to some hospital for several months.

These machines may have a use in the foreign stations where only a small amount of work is done and where it is not imperative to have perfection, as demonstrated by the high energy technique.

*High energy technique.*—As the tendency of the day is toward high energy technique, it seems pertinent to discuss its basic requirements. The three types of "make" on the market are (1) single phase, (2) double phase, and (3) polyphase (condenser type). Each gives equally good results, dependent on the initial electrical inlet, the knowledge of the radiologist and the proper accessories. No true high energy work (200 to 400 ma) can be accomplished without having (1) an impulse timer (rapid break type), (2) a ballistic ammeter, (3) a 1,000 ma tube.

One can highly recommend the Westinghouse (Wappler) Dynex apparatus with the Westinghouse tube, which is simple in construction and operation and gives uniformly excellent results. Of course, this unit includes the impulse timer and the ballistic ammeter.

With high energy technique, results can be obtained in radiology which are highly important from a diagnostic standpoint such as (1) soft tissue detail showing muscle layers, arteries, and veins; (2) calcification of the valves of the heart and of the aorta; (3) early retraction of the nipple and calcification in breast malignancy; (4) visualization of the liver and spleen without "thorotrast"; (5) aneurysm of the left ventricle (double shadows), etc.

*Therapy apparatus.*—All first-class X-ray departments should be equipped to do superficial, intermediate, and deep therapy.

In our civilian hospitals this is considered important enough to have specialists trained in therapy who occupy all of their time in this work. In the Navy Medical Corps each roentgenologist must learn enough about this branch of medicine to practice it intelligently and without danger to his patients or to himself.

At the United States Naval Hospital, Brooklyn, N.Y., during the latter half of 1932 and the first quarter of 1933, all three types of therapy were done on a grand scale for the following reasons: First, a large number of malignancy cases offered suitable material; second, an X-ray officer was in charge of this branch of treatment at all times.

The apparatus was thoroughly standardized as to quality, quantity and accurate X-ray dosage for the three types, determined by physiological skin erythema dose and checked in roentgen units by the Wulf ionometer. Below is a summary of the three types used.



*Superficial therapy*

Broad focus tube			15-inch technique				
KVP	Point gap	Milliamperes	Time	Filter	R units	SED	TSD
			<i>Minutes</i>				
87	5-inch.....	5	6	None.....	325	1	15"
87	do.....	5	6.3	Fiber.....	420	1	15"
87	do.....	5	7.5	1/4 mm. al.....	500	1	15"
87	do.....	5	13.3	1/2 mm. al.....	730	1	15"
100	6.5-inch.....	5	5	Fiber.....	350	1	15"
100	do.....	5	6.2	1/4 mm. al.....	400	1	15"
100	do.....	5	12	1/2 mm. al.....	700	1	15"
100	do.....	5	22	1 mm. al.....	890	1	15"

*Intermediate and deep therapy*

## INTERMEDIATE THERAPY

Victor-snook deep therapy			200 KV model				
KVP	Point gap	Milliamperes	Time	Filter	R units	SED	TSD
			<i>Minutes</i>				
135	9-inch.....	5	3.8	Fiber.....	360	1	20"
135	do.....	5	50	<div style="display: inline-block; vertical-align: middle;"> 1/4 mm. cu.....  1 mm. al.....  Fiber..... </div>	720	1	20"

## DEEP THERAPY

200	14-inch.....	5	80	<div style="display: inline-block; vertical-align: middle;"> 1/2 mm. cu.....  1 mm. al.....  Fiber..... </div>	750	1	20"
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If new deep therapy apparatus is considered for any of our naval hospitals in the future, it is suggested that only the water-cooled type be purchased. There is a very great saving of time and the elimination of much discomfort for the patient.

The following is an organization and routine suggested for the X-ray department of a large naval hospital.

*Personnel.*—With two roentgenologists, a chief pharmacist's mate, three technicians and two other Hospital Corps men under instruction, it appears as though this complement is adequate, but later, during the winter months, another technician or Hospital Corps man will be necessary.

As there is no more confining work than radiology and with the constant danger of accumulation of radio-active substances in the blood stream, it is imperative for the chief of the department to take steps that the personnel may not be unnecessarily exposed. This means that all in this department will be required to take two afternoons off each week for fresh air and suitable exercise, for proper relaxation is believed necessary as a prophylactic measure. Furthermore, each month complete blood counts of all personnel will be taken and recorded, and if at any time any of the complement shows an increasing lymphocytosis or signs of an anemia which is believed dangerous, it will be recommended that such member be relieved from this type of work for a period of 1 month.

For these reasons, it is apparent that the above number of personnel be maintained in this department at all times.

*Expense.*—As the average X-ray department in our naval hospitals is one of the most expensive due to the great cost of highly specialized equipment and the relatively high cost of films, the X-ray officer requests all of the staff to cooperate as fully as possible with this department in its endeavor to keep well within the budget of the fiscal year 1933. Steps are now being made to save the expense of an extra film in several of our routine examinations and if a greater reduction in making "repeat" examinations on the part of the staff can be effected, the total expense will be greatly reduced. Also, when making requests, if the officers will indicate specifically what kind of an examination is required or what part is involved, this will tend to eliminate some of the unnecessary examinations. For example, if the patient is complaining of a pain in the lower back, a request of the lumbar spine and sacroiliac regions would be better than one asking for an examination of the entire spine.

*Relation with other departments.*—Hereafter, all requests for X-ray examinations will come to the department on the N.M.S. Hospital Form 57, with the patient's full name, date, clinical diagnosis, X-ray problems, and a short clinical abstract. The work will then be planned here and each patient will be given a specific time for his appointment and will be notified by the ward nurse through this department. Each day's work is planned in advance; a book is sent to the wards with the patient's name and the time of the examination, which is initialed by the ward nurse and put in the order book, and the patient then comes to this department at a designated time. By the above method, a daily systematic schedule of work is arranged; there is no lost motion or confusion and an equal amount of daily work will then flow through this department. Of course, cases marked "emergency" have priority over all others and this type of case will receive immediate attention at any time with the subsequent transmittal of a typewritten report, telephone communication, or by personal contact.

It is believed that all requests for these examinations should be signed by the ward officer, and not by the internes or nurses.

Requests which have not been properly filled out will be, at the discretion of the X-ray officer, returned for reconsideration.

*Gastrointestinal tract examinations.*—Because the gastrointestinal barium series performed at this hospital is a combined study both by the fluoroscope and film exposure requiring much time and attention to detail, it is recommended that not more than 12 of these series be done each week. Heretofore, the limitation has been set at 8 weekly, but with an additional X-ray officer in this department it is planned to divide the work so as to prevent undue exposure of the roentgenologists.

Examinations will be done on Mondays, Wednesdays, and Fridays at 9 a.m., limited to 4 at each sitting, occupying from 1 to 1½ hours. The patients will be prepared on the wards by written instructions from this department, and if these are supervised by the ward officers, these examinations will be promptly accomplished. Copies of the preparation for gastrointestinal examinations, barium enema, and cholecystography are appended.

*Urological examinations (pyelograms, cystograms, and skioidan).*—After consultation with the urologist, a special time was designated at 10:30 a.m. on Mondays, Wednesdays, and Fridays each week for these special examinations. Except in special cases or in an emergency, it is hoped that this routine will be adhered to as these require the presence of either the chief pharmacist's mate or a trained technician to get the desired results. By this means

reexamination of the case will rarely be necessary and another item of expense will be eliminated.

*Cardiovascular examinations (fluoroscopic).*—On Wednesday mornings at 10 a.m. fluoroscopic examinations of cardiovascular disease is planned. The roentgenologist and cardiologist will see special cases in consultation and by their cooperation will do the necessary fluoroscopic examinations and film examinations in each specific case. The method is believed better than having the cardiologist do his own fluoroscopy with the ever-present danger of excessive exposure both to himself and the patient. Furthermore, the patients get the benefit of another consultant by this procedure.

*Outside examinations (Navy Yard, ships, and families).*—Insofar as possible, except in an emergency, outside examinations will be given appointments and this work will be arranged for in advance, preferably in the afternoon. As this work is to be approved by the executive officer, it is requested that cases be referred to this department for special appointment, preparation, and advice. Of course, there will be times when the above procedure cannot be adhered to, but ordinarily this plan of handling outside work should be carried out. A book with the name, date, time of appointment, kind of examination, and address of the physician to whom the report will be forwarded will be kept in this department.

*Filing system.*—The filing method used in this department consists of a systematic file, the file giving the patient's name, rate, and number, and date at the time of examination and this is filed numerically. Also, this information is put on a card which is filed alphabetically. In addition, the original request with a copy of the findings in each case is filed alphabetically.

A second file, pathologic, is kept classifying the parts and giving the pathological diagnosis. Card and film numbers are used in connection with this file.

The active films for the last year and a half are now stowed in the filing room and a dead list of films for the previous year and a half are kept in a storeroom near the mess hall. Thus, we have access to films for a period of 3 years which is useful for comparison with recent examinations and in the writing of articles for medical bulletins.

It is requested that all officers wishing to take films from this department communicate with the X-ray officer, and these will be removed by the file clerk, who will deliver them to the messenger after he signs for them so there will be a record of their location. Such films should be returned for filing and safekeeping and should not be left in the wards and in other places where they may be damaged or lost.

*Training of junior officers, internes, and technicians.*—Due to the dearth of a sufficient number of trained roentgenologists in the Medical Corps which is now realized by the Bureau of Medicine and Surgery and the commanding officers of various hospitals, it is believed that this hospital will be able to do its share in training suitable officers in this specialty during the next 2 years.

It is hoped that members of our staff will find time to take part in the daily interpretation and fluoroscopic work of this hospital, for the amount of pathological material seen in this hospital is large and compares most favorably with that of other 1,000-bed hospitals and institutions in New York City.

It is recommended that a course of instruction of 9 months' duration be prescribed for the training of technicians. This work will

consist of a daily practical routine and 1 hour of theory each week. In addition, study of the Army Manual and such other books of technique as the roentgenologist believes necessary, will be advocated. At the end of each month, each student will be examined by written, oral, and practical tests to determine his ability and progress.

It is considered essential that each trained technician have a firm basis of theoretical knowledge of electricity and the physical properties of X-rays as well as the knowledge of the upkeep, repair, and installation of equipment, before he will be able to take his place in a laboratory and bear the responsibility of a technician.

*Economy.*—Economy in the organization and the running of an X-ray department has always been important, as radiology is one of the most expensive specialties in our naval hospitals. The total average quarterly expense in this institution during the last 2 years has been \$2,460, making a total yearly cost of almost \$10,000, exclusive of salaries.

During the next several years it is believed that the economical running of a hospital will play a very important part and that our medical officers will interest themselves in this subject more than ever before.

There are several suggestions which may be helpful in the economical planning in X-ray. First, there should be a rigid scrutiny of all original new apparatus sold to the United States Navy. Second, radiologists can do much to reduce the cost of their departments without impairing the efficiency. For example, we take one 14 by 17 chest film in the average routine examination and then if any evidence of disease is noted, other examinations such as the obliques, stereos, and lateral examinations are made. Prior to January 1, 1933, four films were used in the average case, costing the hospital unnecessary expense especially when the examination was negative. It has been recently estimated that \$2,500 yearly could be saved in a hospital of 1,000-bed capacity by this method.

Repeated examinations and constant "retakes" are costly factors in this specialty. Of course, all doctors are particularly interested in getting ideal pictures in every case but to do so is quite an expensive luxury. Also, it irks technicians to repeat case after case because of minor irregularities which are of very little importance in the average interpretation. Naturally, poor films should never be read but there are many fair films which can be properly diagnosed, thus eliminating the expense of a "retake" and avoiding lost motion.

Ward doctors and others in the service take delight in ordering monthly chest examinations in positive cases of tuberculosis. It is usually done to note the progress of the case but sometimes it is

easier to order an X-ray for comparison than to use the stethoscope. Naturally, this type of work adds to the cost of any department.

Quite often physicians, in making requests for X-ray help, are not very definite, asking for X-rays of the entire spine, all joints, etc., for arthritis. In these cases a request for a specific part or parts would be better, saving much time and expense.

Other requests, such as those calling for X-ray examination of teeth, sinuses, heart, lungs, and gastro-intestinal tract at one time, add much useless expense to these departments; also, it is believed that this is the wrong way to practice medicine.

In cases of pneumonia, it has never appeared reasonable to request daily portable examinations of the chest. If one original film is taken, that ought to be sufficient, unless there is a complication such as empyema or abscess, developing at a later date. Daily portable examinations of the chest in these cases are contra-indicated and do more harm than good to seriously ill patients. Psittacosis is, of course, an exception.

In gastro-intestinal barium series including enemas, it is believed that the routine taking of films following fluoroscopy add much expense to the X-ray department. If the art of roentgenoscopic examination is mastered, it would seem better for the radiologist to take only such films as he needs in each specific case. In the average normal case it is only necessary to take a few, so as to have a visual record for the other doctors in the hospital. By this method, great savings have been accomplished at this hospital during the past year.

*Importance of an X-ray officer in the bureau of medicine and surgery.*—It is believed that X-ray activities of the United States Navy are important enough to have a radiologist of sufficient rank detailed to the Bureau of Medicine and Surgery for the following reasons:

1. Many thousands of dollars can be saved yearly.
2. Better standardization and equipment of our X-ray departments in our hospitals could be accomplished.
3. Personnel difficulties which have been present during the past 10 years could be corrected.
4. As an inspector of X-ray activities, he could be of much value to commanding officers and the X-ray officers.
5. As a lecturer and instructor in the Naval Medical School, greater interest in this important branch of medicine would be stimulated throughout the medical corps.

At the present time an officer attached to the Medical Supply Depot, Brooklyn, N.Y., attends to the requisitions for new equipment and supervises new apparatus but it is believed that the X-ray

activities of the United States Navy service as a whole could be definitely improved by the above point in organization.

*An X-ray filing system.*—Prior to the adoption of a standard filing system several years ago, many unusual and complicated systems were in use in the various X-ray laboratories in the United States Navy. In most cases they accomplished the desired results but at the expense of considerable unnecessary clerical work. Systems have been seen which required the typing of X-ray card reports on N.M.S. Hospital Form 57 and again on a 3 by 5 index card, the latter becoming the file copy of the report. It is obvious that for a patient requiring repeated X-ray examinations, one, or several cards could not hold all the reports and the file soon becomes obsolete.

The standard filing system was a step in the right direction but it offers room for improvement. Let us consider the requisites of a good X-ray filing system. First, it should be as simple as possible; second, it should enable anyone to find any film or copy of any report immediately; third, it should contain a complete record of all exposures and technique used for each patient; fourth, it should require the minimum of clerical work. The standard filing system failed in several respects. The report form was not sufficiently stiff to file well and the practice of noting the technique on the back of each report did not allow a ready comparison of the various techniques used. It is evident that the record of all exposures made on a single patient should be grouped on a single form to permit easy reference and to enable a close check to be kept upon the total exposure being given to the patient.

A new system was inaugurated at the United States Naval Hospital, Brooklyn, N.Y., January 1, 1933, and has given satisfactory results, but 9 months' experience with it has developed several faults which can, however, be corrected. It is believed that a standard system should be used throughout the Navy and the following is offered for criticism and possible adoption if found suitable. It is devised to be used with the standard X-ray filing cabinets now in use in practically all of our hospitals.

A manila envelop of about the same weight paper as the film filing jacket but of a size,  $6\frac{1}{2}$  by  $8\frac{1}{2}$  inches, to fit the standard card index file is used. This form carries on its face the patient's name, age, weight, file number, ward, clinical diagnosis, the name of the medical officer referring the case, and a space for remarks. The reverse side has a complete summary of all exposures made, technique, etc. A quantity of these forms are numbered consecutively and when a new patient is referred for an X-ray examination, the face of the lowest numbered form is filled out on the typewriter. This and the N.M.S. Hospital Form 57, which has been prepared in the ward, are turned

over to the technician who, upon completion of the examination, fills out the reverse side with the technique employed, using one line for the complete examination of any one part. It provides space for 20 complete examinations which will be sufficient for all except the most unusual cases. For antero-posterior and lateral examinations or when variable factors are used, the spaces may be divided diagonally and the variable factors entered above and below the diagonal lines.

Only 14 by 17 filing jackets are used and a quantity of them are also numbered consecutively, the jacket having nothing written on it but the number. In a large laboratory a numbering machine is useful but not necessary where only a small amount of work is being done. When the films are dry, the corners are clipped and they, together with the original request and the small envelop form, are placed before the roentgenologist for interpretation. At this time any disease worthy of the pathological file is noted under remarks on the envelop form. The reports are then typed on N.M.S. Hospital Form 57, the original request becoming the file copy, which is folded once and placed in the small envelop form. This form is filed alphabetically and the film jackets are filed consecutively by number.

The pathological file consists of an alphabetical, 3 by 5, card index, each headed by a pathological title and containing a list of the file numbers of the cases which are to be filed under that condition. A record of excellent normal films for purposes of instruction and comparison can also be kept in this file. The pathological file is intended to be permanent and can be continued and expanded indefinitely.

A new series of file numbers is started each year and films, excepting those in the pathological file, are kept for 3 years. The report file is permanent and can be stowed in the main hospital file room after 4 years, which is the capacity of the standard cabinet, allowing one drawer per year. A new envelop is prepared for the first examination of each patient each year and succeeding examinations are entered on the same form. A patient keeps the same file number throughout the year and all films for each case are filed in the same jacket. The date of the examination, L or R, and the file number are marked on the film with lead letters at the time of the exposure.

The advantages of this system are as follows: (1) It is simple and calls for a minimum amount of clerical work; (2) it offers a cross-index by means of which films may be easily located from either the name of the patient, the file number, or the pathological condition. All reports of each case and a record of all examinations with

techniques employed are together in one alphabetical file which is kept permanently. Films may be disposed of after 3 years but the jackets may be used again, only those which are badly worn being replaced. It is economical in that the saving in filing jackets should be sufficient to pay for the new forms and it employs the standard filing cabinets already in use. The 3 by 5 filing cabinets and blank cards are available in all hospitals. It places all previous films and reports on each case at hand for comparison by the medical officer interpreting the films.

In discussing some general considerations and suggestions, some of the following are now adopted in our large up-to-date civilian hospitals in New York City and others are original ideas.

*Rubber deck.*—Although the original cost is greater, the life is longer; it acts as an excellent factor of safety, is easy to keep clean, and the danger of slipping is eliminated.

*Adequate space.*—As this has been discussed before I shall only mention the fact that it is better to have too much space than too little. In most of our hospitals the space has been inadequate.

*Dressing rooms.*—All X-ray departments should have a sufficient number of dressing rooms, at least 2 to 3 in close proximity to the central department. They should be large enough so patients may dress and undress comfortably. It has been my impression that dressing rooms are usually too small.

*Toilet in connection with the fluoroscopic room.*—This is essential particularly in the barium series cases. The practice of sending patients to other departments for toilet purposes in this type of examination is contra-indicated.

*Generating units (transformer and valve tube) in separate rooms.*—The advantages of this are:

(a) Accessibility.

(b) Parts are easy to clean.

(c) Economy of space in the main operating room. Cabinets containing these accessories have all the above disadvantages.

*Fluoroscopy room.*—A fluoroscopy room designed with a light lock, having no windows but with an exhaust blower, is another suggestion. The inlet ventilation via the light lock and the exhaust blower would provide good ventilation at all times. Patients could be wheeled in and out of this light proof room for fluoroscopy, the operator's accommodation would be better at all times as no light could possibly leak through cracks and the necessity for preparing the fluoroscopic room is hereby eliminated; it is always ready for use.

*Dark room.*—Suggestions for a dark room are as follows:

(a) Adequate size. Most dark rooms are too small accounting for defective films and the ruining of screens and cassettes.



(b) A Rubylite painting and lighting system. With this improvement technicians can see what they are doing and errors in loading, developing, and fixing are eliminated.

(c) Light lock with inlet ventilation.

(d) Exhaust light type blower.

(e) Concealed plumbing and electrical wiring. As far as possible, all plumbing and electrical wiring should be concealed in a dark room. Most dark rooms are damp and if these are exposed, dangerous electrical hazards are always present.

*Radiologists as consultants.*—As X-ray officers are often consulted about medical and surgical problems by other members of the staff, it is important for them to be trained internists and surgeons. In addition, they should have some knowledge of dermatology and malignant tumors. Conversely, the other consultants should acquire some idea of X-ray in order to consult intelligently with the radiologist.

*Independent department in the hospital.*—X-ray departments should be independent and should not be directly attached either to medicine or surgery. Although closely allied to these major branches in the organization of a hospital, roentgenologists have specific problems which must be decided by them independently.

*Association with physiotherapy and skin.*—As physiotherapy and the skin specialties are often combined with roentgenology in the smaller hospitals and, sometimes in the larger ones, this is an additional reason for having two roentgenologists attached to our hospitals at all times. Of course, one roentgenologist can supervise all of this work most of the time but when he is on leave or on the sick list, these branches of medicine are sacrificed.

This article has been written to draw attention to the specific problems of the radiologist and with the hope that it may be of help and guidance to others in practicing this interesting and important branch of medicine in the United States Navy.

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#### X-RAY OBSERVATIONS OF PNEUMONIA TREATED WITH SPECIFIC ANTISERA

By J. B. HELM, Commander; D. FERGUSON, Lieutenant Commander; H. J. NOBLE, Lieutenant Commander; Medical Corps, United States Navy

Eight patients with pneumonia due to type I or type II pneumococcus and three patients with pneumonia of undetermined type were treated at this hospital in the past 2 years with Felton's concentrated pneumococcus antibody solution.

The mortality of 25 percent for the fixed type cases is not comparable with results obtained at other clinics because our series is

too small. Despite this, a detailed examination of the individual cases is of interest. A feature of great importance is that three of the patients had X-ray plates made of the lungs daily, after the serum was administered, and the effects of the serum on the pneumonic consolidation are shown.

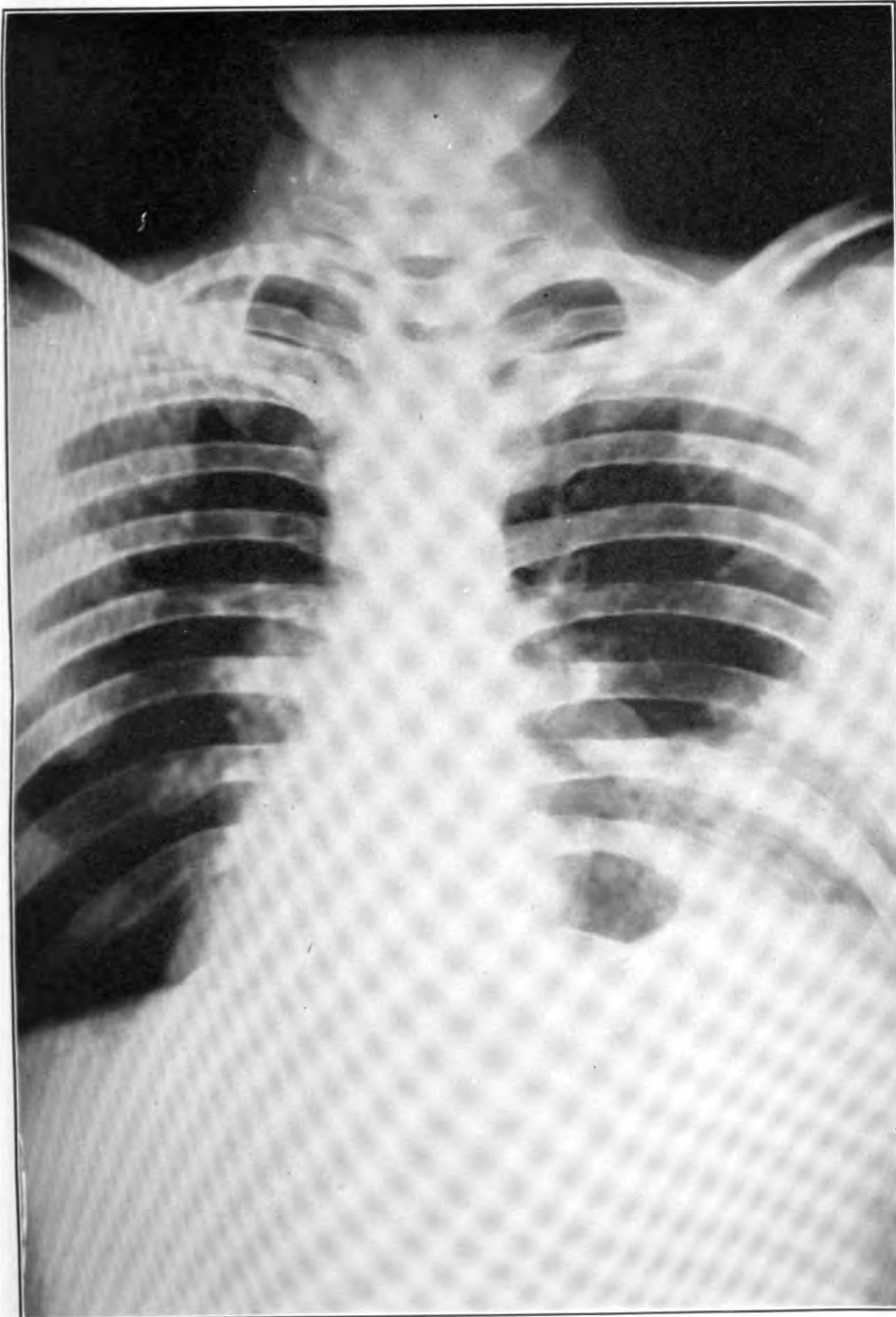
Felton's antibody solution, in brief, consists of blood serum taken from horses vaccinated against type I and type II pneumococcus. The serum is refined by precipitation with distilled water. The finished product is carefully standardized as to potency. The dosage is expressed in units. Each unit is the amount that protects a mouse against one million doses of homologous pneumococcus. Cecil and Sutliff determined the effective dose to be 100,000 units given in 24 hours.

The serum was supplied by the Massachusetts State Department of Public Health through an appropriation made by the commonwealth fund of New York City for the study of lobar pneumonia. Commercial manufacturers of biological products now supply the serum. The serum contains 2,500 to 4,000 units of type I antibody per cc and 1,750 to 3,000 units of type II antibody. It is injected intravenously after a negative anaphylactic history is given, and intradermal and conjunctival tests are made. The dosage recommended is 5 cc, given 30 minutes after the test; if there is no reaction, 25 cc more is given in 2 hours, and an additional 45 cc in the next 2 hours. If necessary, additional doses of from 30 to 45 cc may be given at 6-hour intervals. The object is to get a surplus of antibody solution into the blood stream as rapidly as safety permits. The efficacy of the serum varies directly with the promptness with which it is administered after the onset of pneumonia. The effect of serum is gaged by both temperature changes and symptomatic results. The clinical course of pneumonia treated with concentrated pneumococcus antibody is reported by Sutliff and Finland (1931).

*Type I.*—The average mortality for type I infections not treated by specific antisera is 25 percent. When treated before the third day by serum the mortality is 9 percent. (Lord, 1932.) A group of 207 cases of type I pneumonia treated by serum in the first 4 days showed a mortality of 10.6 percent. (Heffron, 1933.)

Four cases of type I infections were treated by us (cases 1, 2, 3, and 4). All patients received serum prior to the third day of the disease.

Case 3 died on the fifteenth day. There was very apparent benefit from the dose of 14 cc of serum, but unfortunately the supply of serum was exhausted and more could not be obtained. The dose of 14 cc may have been subtherapeutic; the titer of the type I serums first manufactured varied from 2,000 to 6,000 units per cc. The record does not show the titer of the particular serum used. A 6,000-



CASE NO. 1.



unit titer would have given 84,000 units—an amount sufficient for the ordinary infection.

Cases 1, 2, and 4 illustrate the different responses obtained to serum in pneumonias of 13 hours duration, 24 hours duration, and 48 hours duration, respectively.

*Type II.*—The mortality from type II infection, not treated by specific sera, is 48 percent; when treated immediately by sera the mortality is reduced to 14 percent. (Cecil and Plummer, 1932.)

Four cases of type II infection were treated in this series (cases 5, 6, 7, and 8) with one death. (Case 8.) The question of a sub-therapeutic dose may be raised in this latter case. The serum titer is not known, but, as the serum at that time varied from 2,000 to 3,000 units per cc of type II antibody, a maximum of 90,000 units may have been given. The results in cases 5, 6, and 7 were strikingly brilliant.

TABLE I.—A condensed summary of cases

Number of case	Age	Type	Involvement	Onset before serum	Amount of serum	Result
1, GHP..	25	I.....	Right lower.....	48 hours...	25 cc...	Temperature fell from 104 to 100 in 12 hours; for 48 hours, rose irregularly to 103; then ranged between 98 and 101 for 11 days; immediate (12 hours) marked symptomatic improvement.
2, GM...	34	I.....	Right middle.....	13 hours...	30 cc...	Temperature fell from 104 to 98 in 12 hours.
3, FB....	32	I.....	Right upper.....	48 hours...	14 cc...	Temperature fell from 103 to 99 in 12 hours; rose gradually to 104 and remained there 12 days; died fifteenth day of disease.
4, RB....	20	I.....	do.....	24 hours...	75 cc...	Temperature fell from 104 to 99 in 12 hours; rose to 103 and fell to 99 in 24 hours.
5, LA....	32	II.....	do.....	30 hours...	28 cc...	Temperature fell from 104 to 99 in 20 hours.
6, JM....	(?)	II.....	do.....	36 hours...	28 cc...	Temperature fell from 105 to 98 in 16 hours.
7, JFM..	36	II.....	Right middle.....	6 hours...	30 cc...	Temperature 104.6 fell to normal in 48 hours.
8, WFE..	57	II.....	Right lower; right middle; left lower.	48 hours...	30 cc...	Died fifth day of disease; general condition very poor on admission, but slight temporary symptomatic benefit followed serum.
9, TO....	29	(?).....	Right lower.....	72 hours...	15 and 30 cc.	Temperature fell from 103 to 98 in 24 hours; rose to 102 and fell to normal in 12 hours.
10, AHE..	26	(?).....	Left lower.....	12 hours...	17 cc...	Negative anaphylactic history; conjunctival test made; 30 minutes later serum given intravenously; after 17 cc given patient collapsed; died in 15 minutes.
11, HWG..	35	II(?); recheck showed group IV.	do.....	72 hours...	75 cc...	Temperature fell from 103 to 100 in 12 hours; rose to 103 and fell to 100; pulse rate did not fall with temperature second time. Died seventy-fifth day of disease.

*Radiographic observations.*—The radiographic record is interesting in these cases in that the shadows within the chest do not necessarily follow the clinical changes after administration of the serum. Reference should be made to the table as well as the pictures.

In case 2, the serum was given early, 13 hours after onset, and only the middle lobe was involved. There was prompt clearing of the picture with almost total clearing in 48 hours. See illustration (case 2).

The films in case 1, with serum given 48 hours after onset, show about a normal clearing interval although there was marked symptomatic improvement. See illustration (case 1).

The films in case 6, with serum given at 36 hours after onset, show extension of the consolidation on the second day, 16 hours after the serum, in spite of the fact that the patient had his crisis before this film was taken and clinically he went on to a rapid recovery.

Certainly this small series of cases suggests that, roentgenologically, we are not able to judge the clinical progress of this disease in serum-treated cases.

In a type I pneumonia receiving serum 13 hours after onset the temperature fell from 104 to 98 in 12 hours and remained between 98 and 99.2 for following 10 days. Symptoms subsided with temperature drop.

The radiographic findings were as follows:

Portable film: The diaphragm and costophrenic angles are apparently normal. There is a rather sharply defined area of increased density extending outward from the right heart border in the region of the right middle lobe. The right upper and lower lobes and the left lung appear to be well aerated. The trachea and heart shadows are not remarkable. Conclusion: Lobar pneumonia right middle lobe, probably some involvement of the lower portion of the right upper lobe.

5-1-31. Portable film: The area in the right mid-lung field is less dense and smaller in extent.

5-2-31. Portable film: There is further clearing of the right mid-lung field, the density has decreased and the sharp outline has disappeared. There is no evidence of fluid.

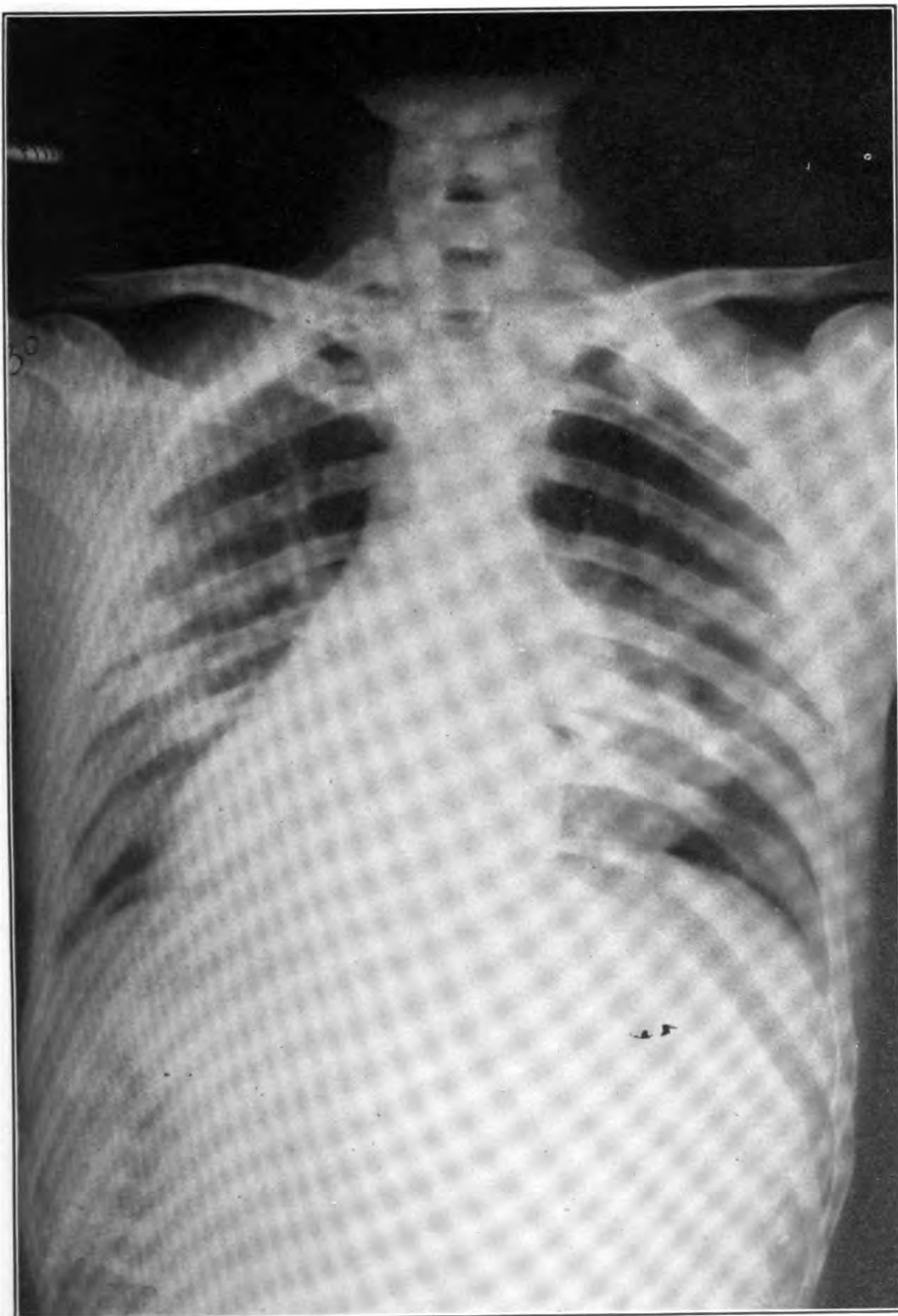
In Case 1, Felton's pneumococcus antibody, 25 cc was given. First X-ray 4-17-31. A type I pneumonia receiving serum about 48 hours after onset.

Temperature fell from 104 to 100 in 12 hours with marked symptomatic benefit. An irregular secondary rise to 103 occurred without symptoms, then the temperature ranged between 98 and 101 for 11 days.

Radiographic findings were:

Portable film: The diaphragm and costophrenic angles are apparently normal. There is a marked increase in density, mottled in character, throughout the right lower lobe. There is some increase in the lung markings in the remainder of the lung fields. The heart shadow is poorly visualized. Conclusion: Pneumonia, lobar, right lower lobe.

4-18-31. Portable film: No noticeable change in the appearance of the right lower lobe. The remainder of the lung fields are clear.



CASE NO. 2.





4-20-31. Portable film: The density in the right lower lobe has increased slightly.

4-21-31. Portable film. The right lower lobe is beginning to clear.

4-23-31. Portable film: There is further clearing in the right lower lobe. The remainder of the lung fields are clear. There is no evidence of fluid.

In case 6 Felton's pneumococcus antibody, 28 cc was used.

This was a type II pneumonia receiving serum 36 hours after onset. Temperature fell from 105 to 98 by crisis in 16 hours with corresponding improvement in symptoms.

#### Radiographic findings:

Portable film: The film shows motion. The diaphragm and costophrenic angles are apparently normal. There is a moderately dense shadow extending outward from the right hilum with a sharp lower border corresponding to the interlobar fissure. The density fades rapidly as it extends upward. The upper half of the right upper lobe and the remainder of the lung field are clear. The trachea and heart shadows are not remarkable. Conclusion: Lobar pneumonia, lower half, right upper lobe.

4-10-31. Portable film: The shadow in the right upper lobe has increased slightly in size and density.

4-12-31. Portable film: There is marked clearing of the right upper lobe.

4-15-31. Portable film: The chest is almost clear. There is no evidence of fluid.

#### SUMMARY

Eight cases of type I and II pneumonia and three cases of group IV pneumonia, treated with Felton's concentrated pneumococcus antibody solution are reported.

Daily X-ray plates are shown of three patients receiving specific antisera, and the effect of therapy on the roentgenological picture is discussed.

3. In the cases here reported, specific antiserum administered 13 hours after onset is followed by a rapid resolution of the pneumonic consolidation as shown by the Roentgen picture.

4. Specific antiserum given after 36 hours may permit the pneumonic consolidation to extend although, clinically, crisis and recovery has equally promptly occurred.

#### BIBLIOGRAPHY

Cecil, R. L., and Plummer, U., J.A.M.A., Mar. 5, 1932.

Felton, L. D., Boston M. & S. J., 190: 819 (May) 1924.

Heffron, R., Unpublished pneumonia studies, 1933.

Lord, F. T., U.E.J. Med., Oct. 29, 1932.

Sutliff, W. D., and Finland, M., J.A.M.A., May 2, 1931.

It is a pleasure to acknowledge the interest, assistance, and many kindness of Dr. Roderick Heffron, field director, pneumonia study and research, Massachusetts Department of Public Health.

**APPENDICITIS—A PLEA FOR MORE AND EARLIER OPERATIONS**

By JOSEPH J. A. McMULLIN, Commander, Medical Corps, United States Navy

Appendicitis, in the minds of many people, means just a bellyache for which surgeons operate. The patient invariably recovers, henceforth to annoy listeners with details of the affair. This idea of appendicitis might be considered facetious if it were not tragic. In recent years the seriousness of acute appendicitis has been minimized unjustifiably by both the medical profession and the general public. Concurrently the death rate has mounted steadily. The comments which follow are neither new nor original but they are essentially true, and like the articles for the government of the United States Navy will bear repetition.

There are two factors responsible for practically every death from acute appendicitis: purgation and procrastination. By procrastination I mean delay in making the diagnosis and delay in deciding to operate. John B. Murphey stated that "In every death from appendicitis somebody is to blame." Sometimes it is the patient who does not seek professional advice, or delays or refuses operation; sometimes the doctor who has the case in charge, through failure promptly to diagnose and urge operation; sometimes, but rarely, the surgeon through an error of judgment or technique. To this list of "sometimes", infection with the *streptococcus hemolyticus* should be added. The type of infection is an important factor in the determination of mortality. The doctor is not responsible for the virulence of the organism, but he is responsible for failure to diagnose and operate with the utmost celerity. Thirty years ago when medical students were memorizing a set of rules to determine when to operate in acute appendicitis, John B. Deaver uttered the dictum: "Operate just as soon as the diagnosis is made." This rule was modified in later years only by his realization that it is utterly futile to remove the appendix in the presence of general spreading peritonitis.

There are surgeons who still abide by Deaver's original dictum and operate upon every case of acute appendicitis as soon as diagnosis is established, including cases of general spreading peritonitis. There would be no occasion for dispute if every case were diagnosed and operated upon promptly.

In the Navy the personnel of the Medical Department are indoctrinated against the danger of purging any patient complaining of abdominal pain. Deaver's three "P's": purgation, perforation, and peritonitis never should be forgotten. Appendicitis, peritonitis from any other cause and mechanical obstruction of the bowel should be considered and ruled out before ordering a purgative.

Generally speaking, cases of acute appendicitis come to operation earlier in the Navy than in civil life. In civil life there is an economic factor which militates somewhat against prompt operation. When a wage earner enters a hospital his pay stops, and he is confronted with a hospital bill and a surgeon's fee, or otherwise assumes the status of a charity patient. If the attack can be "frozen" out with an ice cap, or "cured" with a hot water bag, considerable saving in time and money apparently is effected. The temptation to avoid operation is considerable. More often than not the operation is delayed and not avoided, and the penalty for delayed operation is fecal fistula, intestinal adhesions, incisional hernia, or death. In the Navy such economic factors do not exist, and there is no good reason why every case of appendicitis should not be operated upon within 12 hours of the inception of an attack, except in isolated places and sometimes aboard ship. If the ship has an operating room there is no reason why every case of appendicitis should not be operated upon promptly at sea, and the same safe policy of immediate intervention carried out as advocated in hospitals ashore.

The operation is seldom difficult. Every medical officer in the service should be qualified to cope with this and other surgical emergencies before going to sea. The majority of medical officers are qualified to operate, and to these I wish to emphasize the veritable well-known fact that although many cases of acute appendicitis subside no one can foretell with absolute assurance how any given case will terminate.

The performance of major surgical operations, other than emergencies, should not be encouraged aboard ship. It is advisable, however, to do minor operations from time to time in order to train members of the hospital corps in operating room technique. *The policy of sending one or more hospital corpsman with operating room training to every ship afloat is to be commended.*

During the past 20 months the U.S.S. *Wyoming* was actually at sea 227 days. During this period of time 13 appendectomies were performed. These patients were operated upon within 12 hours of the beginning of the attack. Spinal anaesthesia is the method of choice for appendectomy aboard ship. It should be given preferably between the third and fourth lumbar vertebrae, and not in excess of 150 milligrams of novocaine dissolved in the patient's spinal fluid. A blood pressure reading is taken before operation and seventy-five hundredths gram of adrenalin administered subcutaneously just prior to or during the administration of the spinal injection.

A reliable man should observe the patient's pulse and respiration. Vomiting is not an infrequent occurrence, especially if traction be made upon the peritoneum or the mesentery of the bowel. Release

of such traction and deep breathing remedy this condition, which never lasts more than a few minutes. Inhalation of aromatic spirits of ammonia also helps. It is advisable to discontinue operative maneuvers until the vomiting subsides. Facial pallor, a reduction of the pulse and respiratory rate, and a drop of from 5 to 15 points in the blood pressure are usually observed. It is neither essential nor desirable to keep the patient's head lower than the rest of the body during the operation. The head of the table may be lowered to combat shock, but this seldom will be necessary. There should be at hand and ready for use 1,000 cc of physiologic salt solution containing 1 cc of adrenalin to be administered intravenously should the patient exhibit signs of alarming collapse. Collapse is extremely rare when the anaesthetic is introduced in one of the lower lumbar interspaces. If the blood pressure be maintained within reasonably normal limits there is no occasion for anxiety.

When appendectomy is performed in the initial stage of an attack the McBurney incision is used. This incision requires less cutting and less sewing, minimizes the danger of spreading infection to the general peritoneal cavity, and enables one to complete the operation rapidly. The oblique skin incision, about  $2\frac{1}{2}$  inches long, is placed about 1 inch medial to the anterior superior spine of the ilium. Inexperienced operators have difficulty sometimes in locating the caecum with its anterior longitudinal band leading to the base of the appendix, especially when coils of the small intestine present through the peritoneal incision. If the caecum cannot be located the small intestines should be walled off with one or two specially made 3- by 8-inch sponges to which a tape and hemostat always should be attached. The operator should not hesitate to cut the transversalis and internal oblique muscles when the McBurney incision is inadequate, but it should be necessary to do so only in rare instances. Drainage is not required when early operation is performed, and in the absence of infection severed muscles heal promptly and soundly. There is a general illogical prejudice against the use of the McBurney incision in acute appendicitis. I have used it for 25 years, and have a conviction that it is the safest and best approach when the operation is performed within the first 24 hours of the attack, and when the diagnosis is clear cut, and exploration of the abdominal cavity is not contemplated.

Following the operation the patient should lie flat on his back, and not placed in Fowler's position until 2 hours later, when continuous proctoclysis of salt solution should be started. In severe cases intravenous transfusions of 1,000 cc of physiologic salt solution containing 5 percent glucose are administered every 8 hours for the first 24 or 48 hours.

A word of caution against the danger of burning the patient with hot water bags is in order. Anaesthesia of the legs is first to appear and last to disappear, and there is a real danger of inflicting severe burns unless the attendant assures himself that the bags are not too hot and are kept properly covered. In mild cases water by mouth is allowed immediately, one ounce every half hour except when the patient is asleep. Otherwise water by mouth and liquid nourishment are allowed on the second, third, or fourth day, depending upon the severity of the symptoms. The rectal tube and morphine sulphate are used to relieve gas pains. An enema is given at the end of 48 hours; if effective, and the condition of the patient is otherwise satisfactory, a light soft diet is ordered. It is advisable to wait until the patient's bowels move before placing him on a soft diet.

The details of the operation and post-operative treatment, however, are comparatively unimportant compared with the vital necessity of prompt diagnosis and immediate operation. From the all important standpoint of mortality, it would be far better for a mediocre surgeon to operate in the early hours of an attack than to have the most skillful surgeon in the world do so after general peritonitis had ensued. The question for each medical officer to ask himself when confronted with a case of acute appendicitis at sea is: "Which is the more dangerous, the disease or the operation?" If he is qualified to operate, the disease is more dangerous; if he is not qualified to operate the disease is safer. It is certainly futile for him finally to decide to operate after generalized peritonitis has ensued and the patient has gone down into the valley of the shadow of death.

#### THE HUMAN RESPONSE TO IMMUNIZATION WITH TYPE I PNEUMOCOCCUS VACCINE <sup>1</sup>

By DAVID FERGUSON, Lieutenant Commander, Medical Corps, United States Navy

In a preliminary report,<sup>2</sup> published in 1932, the subject of active pneumococcus immunity was reviewed. The literature relating to attempts at immunizing humans was examined. Mice and rabbits were immunized with formalin-killed, highly virulent strains of type I, II, and III pneumococci, and high degrees of immunity were obtained against type I and II pneumococcus. The duration of the immunity was not determined. The defects common to all unsuccessful human experiments were stressed i.e.;

- (1) The vaccine was not of proven antigenic power.
- (2) The pneumococci constituting the vaccine were not shown to have been properly preserved.

<sup>1</sup> Received for publication Nov. 3, 1933.

<sup>2</sup> U.S. NAVAL MEDICAL BULLETIN, July 1932.

This report concerns the immunity resulting in three men following the subcutaneous administration of a type I vaccine of (1) proven antigenic power and in which (2) the pneumococci have been preserved intact.

#### VACCINES

The vaccine is prepared from highly virulent cultures obtained from the heart blood of a moribund mouse following the intraperitoneal injection of 5 to 10 highly virulent pneumococci.

The heart blood is seeded in broth flasks enriched with 1 percent defibrinated rabbit cells. The broth is made to approximate chemically the blood serum in its total proteid, urea, sugar, chlorides, calcium, and hydrogen-ion concentration. The rational is to obtain only the most virulent strains of the culture, and to grow them on a medium which offers a pabulum permitting the organisms to retain their specific biochemical constituents as little unchanged as possible from those developed during growth in the blood stream of a living animal.

The vaccines had been prepared by centrifugalizing the organisms, washing them in saline, killing with 0.2 percent formalin in saline, and then suspending the organisms in 0.5 percent phenol in saline.

It was found that the pneumococci autolyzed completely and regularly in a short time. Various modifications to prevent autolysis were tried. In all, 38 vaccines were made and tested during the past year.

The solutions were alkalized; the salt solution was made hypertonic then hypotonic; the phenol was omitted; merthiolate was substituted for phenol; then for formalin as by Kendall's method; then for both. Occasionally a method would seem to give proper preservations but subsequent examinations would show that autolysis of the cells continued.

Dr. L. D. Felton very kindly permitted the use of his methods and equipment for making and preserving pneumococcus vaccine. In brief, the organisms are collected by centrifuge; then killed by suspending in acetone for 24 hours; centrifuged again, the acetone poured off, and the organisms dried in vacuum. Dr. Felton permitted the examination of a vaccine 18 months old which was made and preserved in this way. The pneumococci were found to be morphologically intact and the vaccine was antigenically powerful.

#### METHODS

It is possible to demonstrate that immunity results from the administration of a vaccine by one of two procedures. First, a group of volunteers may be given vaccine, and the incidence of disease occurring in that group may be compared with the incidence in an

uninoculated group. Secondly, a small group of volunteers may be selected and their blood serum tested for its specific protection power before, and at intervals after, the administration of the vaccine.

The first method has certain disadvantages, i.e.: Great numbers are necessary, book-keeping is difficult, those susceptible to the disease will volunteer while the natural immunes tend to fall into the control group. A more satisfactory experiment would be the vaccination of all recruits at entry into the Military Service, where as in the United States Navy, the incidence of a disease among first cruise men is readily available for any number of previous years. After 2 years of vaccination of all incoming recruits the effects on the incidence of a disease would be readily apparent.

The second method also has disadvantages. It is time consuming and expensive. Furthermore, it must eventually be followed by the use of the first method. At best, the information obtained from it would merely warrant the trial of the first method.

This second method was used to evaluate the immunity responses recorded in this report.

The blood was collected; the serum separated; 0.2 cc of serum was injected into the peritoneal cavity of a white mouse followed immediately by the intraperitoneal injection of the desired number of lethal doses of pneumococci.

The lethal doses were made in decimal dilutions of 8 hour broth cultures of highly virulent strains. Broth, not saline, was used as the diluent. The seventh decimal dilution of a highly virulent type I culture regularly kills mice in 30 to 40 hours when injected intraperitoneally in 0.1 cc amounts.

#### THE HUMAN IMMUNITY RESPONSE TO TYPE I VACCINE

Chart I shows that the blood serum of three men, A, B, C, in the amount of 0.2 cc failed to protect mice regularly against 10 and 100 lethal doses of type I pneumococcus.

Chart II is record of the subcutaneous administration of a type I vaccine to these three men. The organisms of this vaccine had been killed by acetone and they were preserved by drying in vacuum. This vaccine had been tested as to its antigenic power. Tests showed that a single subcutaneous injection of about 20 million organisms conferred protection against 10,000 lethal doses of type I pneumococcus to 1 of 2 white mice, and against 1 million lethal doses to 3 of 4 white rats.

Chart III is a record of a preliminary titration of the immunity response in these three men, made 13 days after the administration of the vaccine was completed. This experiment shows that the blood serum of A and B after vaccination regularly protects mice against 100 and 1,000 lethal doses of type I pneumococcus. The

serum of C protects 1 of 2 mice against 100 lethal doses and against 1,000 lethal doses. This latter is an indeterminate result which is checked in the succeeding experiment recorded in chart IV.

CHART 1.—*The immunity to type 1 pneumococcus in 3 men before vaccination*

Subject	Mouse	Blood serum cc.	Number lethal doses of type 1	Result
A.....	1	0.2	10	Died 80 hours.
	2	.2	10	Do.
	3	.2	100	Died 30 hours.
	4	.2	100	Do.
B.....	1	.2	10	Died 96 hours.
	2	.2	10	Survived.
	3	.2	100	Died 96 hours.
	4	.2	100	Do.
C.....	1	.2	10	Died 50 hours.
	2	.2	10	Died 36 hours.
	3	.2	100	Died 84 hours.
	4	.2	100	Died 38 hours.
Controls.....	1	0	1	Do.
	2	0	10	Died 48 hours.

*Conclusion.*—Sera A and C gave no protection against 10 lethal doses of type 1 pneumococcus; serum B protected 1 of 2 mice against 10 lethal doses but gave no protection against 100 lethal doses.

CHART 2.—*Immunization data on A, B, and C*

[Number of type 1 pneumococci in millions]

	8-23	8-29	9-3	9-7	9-13
A.....	0	50	200	100	200
B.....	50	200	200	100	200
C.....	0	50	200	100	200

Reactions B and C, none. A had a slight temperature for a few hours on 8-29; no reaction on 9-3; a temperature to 101 for a few hours on 9-7; and a temperature to 101.4 for a few hours on 9-13. He was not incapacitated.

CHART 3.—*The immunity against type 1 pneumococcus 13 days after last injection of type 1 vaccine*

Subject	Mouse	Blood serum cc	Number lethal doses of type 1	Result
A.....	1	0.2	100	Survived.
	2	0.2	100	Do.
	3	0.2	1,000	Do.
	4	0.2	1,000	Do.
B.....	1	0.2	100	Do.
	2	0.2	100	Do.
	3	0.2	1,000	Do.
	4	0.2	1,000	Do.
C.....	1	0.2	100	Died 82 hours.
	2	0.2	100	Survived.
	3	0.2	1,000	Died 36 hours.
	4	0.2	1,000	Survived.
Controls.....	1	0	1	Died 44 hours.
	2	0	1	Died 36 hours.
	3	0	10	Do.
	4	0	10	Died 45 hours.

*Conclusion.*—Sera A and B protected against more than 1,000 lethal doses of pneumococcus. Serum C gave an irregular protection which cannot be evaluated.



Chart IV is a record of a titration of the immunity response in these same three men, made 28 days after the last injection of the vaccine. It shows that 0.2 cc of the blood serum of A and B protects mice regularly against 10,000 and 100,000 lethal doses of type I pneumococcus. The serum of C regularly protects mice against 100, 1,000, and 10,000 lethal doses of type I.

CHART 4.—*The immunity against type 1 pneumococcus 28 days after the last injection of type 1 vaccine*

Subject	Mouse	Blood serum cc	Number lethal doses of type 1	Result
A.....	1	0.2	10,000	Survived.
	2	0.2	10,000	Do.
	3	0.2	100,000	Do.
	4	0.2	100,000	Do.
B.....	1	0.2	10,000	Do.
	2	0.2	10,000	Do.
	3	0.2	100,000	Do.
	4	0.2	100,000	Do.
C.....	1	0.2	100	Do.
	2	0.2	100	Do.
	3	0.2	1,000	Do.
	4	0.2	1,000	Do.
	5	0.2	10,000	Do.
	6	0.2	10,000	Do.
Controls.....	1	0	10	Died 36 hours.
	2	0	1	Do.

*Conclusion.*—Sera A and B protect against more than 100,000 lethal doses of type 1. Serum C protects against more than 10,000 lethal doses of type 1.

Chart 5 records an experiment made to determine the approximate height of the immunity obtained in the same three men against type 1 pneumococcus 38 days after the last injection of vaccine. This experiment was necessary in order to evaluate a future study which has for its object the determination of the duration and the degree of the immunity in these three men.

This experiment shows that 0.2 cc of the sera of A and B fails to protect mice against 1 million lethal doses and that the serum of C fails to protect against 100,000 lethal doses of type 1 pneumococcus.

CHART 5.—*The height of the immunity response 38 days after vaccination*

Subject	Mouse	Blood serum cc	Number lethal doses, type 1	Result
A.....	1	0.2	1,000,000	Died 60 hours.
	2	.2	1,000,000	Died 84 hours.
	3	.2	10,000,000	Died 24 hours.
B.....	1	.2	1,000,000	Died 90 hours.
	2	.2	None	Survived, see below.
	3	.2	10,000,000	Died 88 hours.
C.....	1	.2	100,000	Died 21 hours.
	2	.2	100,000	Died 38 hours.
	3	.2	1,000,000	Died 22 hours.
	4	.2	1,000,000	Died 21 hours.
	5	.2	10,000,000	Died 24 hours.
Controls.....	1	0	10	Died 36 hours.
	2	0	1	Died 38 hours.

NOTE.—Mouse B 2, through an omission impossible of correction, did not receive the scheduled million lethal doses of type 1 pneumococcus.

## COMMENT

The three experiments recorded show that the resistance against type I pneumococcus may be regularly increased by the administration of a properly prepared and properly preserved type I pneumococcus vaccine. The bizarre titration in the second test on C was evidently due to the insufficient number of mice used.

It is interesting to calculate the degree of immunity obtained in terms of Felton's units. Felton has wisely advocated that pneumococcus antibody solution be measured in units instead of in cubic centimeters. He suggests as a unit the amount of antibody necessary to protect mice against 1 million lethal doses of homologous pneumococcus.

The amount of blood serum in man may be calculated as one third the volume of blood. The blood volume may be estimated as one third the volume of blood. The blood volume may be estimated as one thirteenth of the body weight. Therefore a 150-pound man would have about 2 liters of blood serum. Since 0.2 cc of blood serum from two of these vaccinated men protected mice against 100,000 lethal doses of pneumococcus, 2,000 cc of their serum would contain more than 1,000 Felton units.

Cecil and Sutliff determined that 100,000 units are necessary to cure pneumonia. It seems reasonable therefore to suppose that a much smaller amount of antibody—possibly one one hundredth of the curative dose—would ordinarily prevent the development of pneumonia.

A puzzling question in the epidemiology of pneumonia has been: If the immunity response results in definite new chemical substances occurring in the blood, why and how can they be depressed by (1) chilling, (2) fatigue, (3) exposure, (4) other illness?

Aycock in his studies of the epidemiology of acute anterior poliomyelitis was confronted by this same puzzling question. His studies led him to the belief that there are two factors in the organism concerned in the resistance to communicable disease. One of these is the immunological factor; i.e., the presence of definite chemical substances present in the body of an otherwise suitable host. The other factor Aycock designated as autarceologic resistance. This is defined as "the protective power against disease which exists in the body by reason of a normal or balanced physiological activity, as distinguished from *immunity*, that form of resistance which is built up as a result of invasion of the body by the disease-producing agent."

The application of Aycock's conception of resistance would permit of the following explanation of pneumococcus resistance in man: (1) If a person with no new chemical substance in the blood

is exposed to pneumonia, disease does not result if that person is autarceologically resistant.

(2) If not autarceologically resistant and *with no* new chemical substance in the blood, exposure to pneumonia results in disease,

(3) If not autarceologically resistant and *with* new chemical substance in the blood, exposure to pneumonia still does not result in the disease.

(4) Chilling, fatigue, exposure to cold, and other illness does not depress the chemical substance in the blood but does depress autarceologic resistance.

(5) Depression of autarceological resistance does no harm, provided the blood contains the necessary chemical substance.

#### SUMMARY

Titration of the blood serum of three men were made before and after the administration of a specially prepared and preserved type I pneumococcus vaccine.

Before the administration of the vaccine the blood serum of these men did not protect white mice against 10 lethal doses of type I pneumococcus.

Twenty-eight days after the administration of the vaccine the blood serum of two men protected mice against more than 100,000 lethal doses, and the serum of the third man protected mice against more than 10,000 lethal doses of type I pneumococcus.

The administration to three men of a properly prepared and preserved vaccine made from type I pneumococcus is followed regularly by a great increase in the resistance of the blood serum against homologous pneumococcus.

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## BIBLIOGRAPHY

- Aycock, W. L., *Jour. Preventive Med.* 3: 274 (May) 1929.  
Cecil, R. L., and Sutliff, W. D., *J.A.M.A.* 91: 2035 (Dec. 29) 1928.  
Felton, L. D., *Pneumococcus Studies*, as yet unpublished.  
Felton, L. D., *J.A.M.A.* 94: 1893 (June 14) 1930.  
Ferguson, D., *U.S. Nav. Med. Bulletin* 30: 40 (July) 1932.  
Kendall, A. I. Sutton, D. C., and Rosenblum, A., *Am.J.M.S.* 182: 454 (Oct.) 1931.

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BOTULISM

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Botulism is an acute intoxication caused by the exotoxin elaborated in food by *Bacillus Botulinus* (*Clostridium Botulinum*). The disease is afebrile and characterized by weakness or paralysis of muscles, constipation, disturbances of vision, and deglutition. Symptoms begin 18 to 72 hours after the ingestion of poisonous food. The death rate is high. The name botulism was given to the disease because the first recognized cases, in Europe, came from sausage poisoning (botulus, sausage). It is now recognized, however, that botulism may arise from almost any food substance containing traces of protein of either animal or plant origin. The organism is one of wide distribution, present in soil and refuse in many localities throughout the world. Botulism was recognized clinically by the Germans as early as 1735. The organism was not discovered until 1895 when Van Ermengem isolated and identified it during an outbreak in Ellezelles, Belgium. One hundred and eighty-six outbreaks of botulism have taken place in North America from 1899 to 1929, 137 connected with plant and 30 with animal foods, 19 not being determined. The mortality rate has been about 60 percent. Seventy-five of these outbreaks occurred in California. California cases from 1889 to 1933 (Mar. 16), which brings the record up to date, notes 93 outbreaks involving 222 persons, with 138 deaths, a mortality rate of 62.61 percent. This high incidence is apparently accounted for by the frequent occurrence of *clostridium botulinum* in California soil.

The organism causing botulism is a spore bearing anaerobe which multiplies at incubator as well as ordinary room temperature. It produces, as it grows anaerobically on animal or vegetable food, a soluble, highly potent, specific exotoxin. When contaminated food containing the preformed toxin is ingested, a certain incubation period elapses before any symptoms are manifest other than occasionally an attack of nausea. This incubation period varies inversely with the potency and amount of toxin ingested.

A number of strains of *Clostridium Botulinum* have been isolated. Immunological studies indicate at least 4 and possibly 5 types (A, B, C<sup>1</sup>, C<sup>2</sup>, and D) on the basis of the kind of toxin produced, while the agglutination tests subdivide these broad and practical groups into numerous subgroups. In the course of artificial cultivation the toxin-producing property of a strain concerned in botulism may be lost (Gunnison & Meyer).

Although each type produces a specific type toxin, the symptomatology, pathology, prevention and treatment of all are the same. In the production of antitoxin all types of toxin must be used and a polyvalent antitoxin used in therapy.

As noted above, *Clostridium Botulinum* is a spore bearer. While the toxin is readily destroyed by boiling for 10 minutes, the spores are highly resistant, surviving boiling temperature for several hours. Autoclave temperatures are required to kill the spores, 15 minutes at 110° C. or a shorter time at higher temperatures being sufficient. It may be seen that unless the housewife uses a "pressure cooker" for canning vegetables in the home she is not able to render them safe from the danger of botulism. Regulations for the commercial canning of vegetable and meat products in California require the heating of such products at specific high temperatures and for definite lengths of time. These regulations are carefully enforced by the Department of Public Health. Thus since 1925 no case of botulism has occurred from the use of products packed commercially in California. Many animals are very susceptible to botulinus toxin. Moldy silage may cause botulism in horses and cattle. "Limber neck," due to paralysis of neck muscles, is usually the first symptom noted in fowles.

The symptoms of botulism are distinctive and it stands alone as a type of food poisoning. The distinctions between botulism and "food poisoning" caused by the (*Salmonella*) enteritidis paratyphoid group of organisms, often erroneously called "ptomaine poisoning", should be emphasized and will be discussed later under the differential diagnosis of the disease.

As noted previously, the symptoms of botulism may begin as early as 12 hours after the ingestion of the poisonous food or may be delayed for 72 hours or more. Rare cases have been reported beginning as early as 2 hours or as late as 8 days. When gastro-intestinal symptoms follow the ingestion of the food they are usually minor (illustrated in our two cases), and are usually not characterized by diarrhea and cramps. The temperature is normal or subnormal. The earliest symptoms are vague; a feeling of weakness, malaise, fatigue, dizziness, and occasionally headache. The patient may attribute these symptoms to the constipation which is also usually present.

Disturbances of vision are the earliest definite symptom of the effect of the toxin and are due to its action on the nerves supplying the extrinsic ocular muscles and the levator palpebrae, the 3d, 4th, and 6th cranial nerves. Accommodation is affected early, vision is blurred, there is ptosis of the lids, the pupils are often dilated, and the light reflex lost, secretory activity is depressed. Saliva is scanty, usually thick and mucoid in character. To the patient, diplopia is the most striking early symptom and in suspicious circumstances is almost pathognomonic. Disturbances in swallowing and talking soon appear. Attempts to swallow food, fluid, or saliva often bring on alarming spells of choking in which the patient becomes cyanotic. Fluid may be insufflated into the trachea or regurgitated through the nose. The tongue is usually coated and the breath may be foul. A sense of constriction and dryness of the throat, weakness of the tongue and pharyngeal muscles is complained of by the victim. Difficulty in coordination and general muscular weakness follow rapidly. There does not appear to be a true paralysis present but the muscles are often so weak that neither arm nor leg can be lifted. There is said to be complete absence of sensory disturbances and no pain. One of our patients complained of a persistent bitter taste which, after he convalesced, disappeared, to return whenever he became hungry. Consciousness is remarkably clear until shortly before death. The pulse is normal or slow at first and becomes rapid toward the end. The blood pressure is not affected. Urine, blood, and cerebrospinal fluids show no significant change. The temperature is normal or subnormal throughout. Respiration becomes, in the fatal cases, progressively more difficult and labored until toward the end the patient becomes cyanotic and death results from complete respiratory failure.

There are no characteristic gross nor microscopic pathological lesions in botulism. Congestion, edema, with occasional small hemorrhages of the brain and lungs are reported.

Congestion and cloudy swelling of the liver, spleen, and kidneys are noted. The heart muscle is flabby and there may be subserous hemorrhages in the pericardium, pleura, or peritoneum. Authorities agree that there are no microscopic changes in the ganglion cells. Ophüls reported cellular thrombi in the vessels of a number of cases which he studied. This finding, however, does not appear to be constant and occurs only in those cases of relatively long duration. The diagnosis rests upon the symptom complex described, and the final proof upon the demonstration of the toxin in the food ingested. The finding of botulinus organisms alone is not conclusive as these are widely distributed in nature. Toxin must be demonstrated by using experimental animals, either through feeding, or better, through injection of the bacteria-free filtrate of the food

culture. The toxin is of high potency; 0.000,001 cc has been sufficient to kill a 250 gram guinea pig in 4 days.

Conditions which one should rule out in differential diagnosis are cerebral vascular accidents, alcoholic intoxication, encephalitis, acute anterior poliomyelitis (bulbar type), and food poisoning. Botulism does not show the elevated blood pressure present in cerebral arteriosclerosis with hemorrhage. Its ocular and muscular phenomena are bilateral and equal, not unilateral and unequal as is usual in cerebral hemorrhage or thrombosis. Cerebral accidents do not have a step like progressive muscular involvement beginning with ocular disturbances, showing general muscular weakness and ending in respiratory failure. The incoordination of acute alcoholism is easily distinguished from the muscular palsies of botulism. In alcoholism the positive findings of alcoholic odor on the breath and high content of alcohol in blood and urine serve to distinguish the two. Encephalitis is not apt to be confused clinically. Histopathologically encephalitis is distinguished by the evidence of inflammatory reaction and perivascular round cell infiltration in the brain. Poliomyelitis, bulbar type, may have confusing pharyngeal symptoms with nasal regurgitation of fluid and choking attacks. Its stage of invasion, however, is febrile and its paralysis is usually maximal when discovered with subsequent improvement. It lacks the ocular and general muscular reactions characteristic of botulism.

Food poisoning caused by the salmonellae (enteriditis—paratyphoid group) is common following the ingestion of hash, salads, or other similar food preparations which have been allowed to stand after preparation for hours or overnight in a warm place. These organisms are not spore formers and grow aerobically. The symptoms are chiefly gastrointestinal with fever, diarrhea, cramps, nausea, vomiting, and collapse. It is an acute, self-limiting infection, and is not characterized by paralysis nor ocular symptoms (diplopia and ptosis) so striking in botulism.

The prognosis in any case of botulism is grave. The average death rate is over 60 percent. The severity of the poisoning is inversely proportional to the period of incubation. When symptoms begin early (less than 48 hours) following the ingestion of the poisonous food, the disease will be severe and in 85 percent of such cases the result has been fatal. The majority of deaths occur in from 3 to 6 days. If the patient survives the tenth day statistics indicate that he will probably recover. There are no permanent sequellae. As in one of our cases, ocular symptoms may persist for months but recovery is complete though prolonged.

The prophylaxis of botulism rests upon the proper heating of material to be canned so that the heat-resistant spore of the organism

will be destroyed. To do this an autoclave is necessary, as a temperature of 110° C. or over for 15 minutes is required. The small autoclaves, designed for home use, called "pressure cookers", solve this problem for the housewife. Other methods of canning, including the popular "cold pack" method, offer no protection from botulism whatsoever. Whether or not the food, removed from a jar or can, be suspected of botulinus poisoning, protection may be attained by vigorously boiling the contents for at least 10 minutes, thus destroying the thermolabile toxin.

Therapy in botulism has been mainly symptomatic and supportive. After respiratory symptoms have developed, there appears to be little that can be done to alter the course of the disease. Although antitoxin is a specific preventive and experimental animals have been saved by its injection after symptoms have developed, antitoxin has never been successfully used in man (Jordan). Benefit should, however, result if the antitoxin is given early enough and further effort is clearly indicated. The polyvalent serum should therefore be used as soon as the diagnosis is made. Antitoxic serum is obtainable from the Jensen Salsbery Laboratory at Kansas City, Mo.

Edmunds and Long (as quoted by Cecil) find that botulism is a curare like paralysis of motor nerve end plates in voluntary muscle. On the basis of this experimental work Cecil recommends artificial respiration, if necessary, by means of tracheal canula and bellows, also the cautious administration of physostigmin.

Alcohol detoxifies botulinus toxin in vitro. In a number of cases persons who partook of alcohol along with the food containing botulinus toxin were protected. Alcohol, however, is of no benefit after the toxin has been absorbed. Morphine has been found to delay symptoms in the experimentally produced disease. It therefore should be used in full doses until antitoxic serum has been obtained and injected.

Sodium amytal given intravenously in full doses has recently been found to inhibit the action of strychnine and protect the patient until the alkaloid has been excreted (Kempf et al.). It has also been found to be a marked aid in spider poisoning (Hall and Vogelsang) in which the poison is a rapidly acting neurotoxin. We believe that sodium amytal should be tried in experimental animals and man in the treatment of botulism.

CASE 1.—McB., W., age 49, white, United States, admitted 2 a.m., November 30, 1932.

*Diagnosis.*—(Tentative on admission) food poisoning.

*Complaints.*—Inability to swallow, nausea, gagging with occasional vomiting, inability to talk clearly, weakness of tongue, difficult respiration.

*Past history.*—Unimportant (always very well).

*Occupation.*—Salesman and rancher.

*Family history.*—Negative.



**Marital history.**—Married 15 years; wife living and well, 2 pregnancies—2 normal boys living and well.

**Present illness.**—(History given by wife). During the evening of November 28, he began to have gastric distress, was troubled with gas and bloating. Took a dose of sodium bicarbonate and retired at 9 p.m. Awakened at 1 a.m. (Nov. 29), felt nauseated and bloated, took dose of soda; 5:30 a.m., awakened and told his wife he had stomach ache. Took some milk of magnesia and soon vomited "almost a gallon." An enema was taken at 9 a.m., with poor results. At 10 a.m. drank a cup of bouillon. At 11 a.m. complained of head feeling heavy, headache, and blurring or double vision. Another enema was given with only moderate results. Slept until 2:20 p.m. When he awakened tongue was thick, could not talk well, legs felt weak; 2:30 p.m., driven, in car, by wife, to town of La Mesa, 15 miles, saw a doctor who gave an injection of apomorphine followed by copious vomiting; 4:30 p.m. went to home of sister in San Diego. When he arrived there it was noticed that he staggered on alighting from the car and walking into the house. He complained of blurred vision and inability to open eyes. Said he could not taste cigarette. Burned finger while lighting cigarette. Talked thickly. Entered hospital at 2 a.m., November 30, 1932.

**Physical examination.**—A white male, 49 years of age (looks somewhat younger). Expression intelligent. Height 6 feet, weight 160 pounds. Muscular in appearance. Skin ruddy and normally moist. No abnormality of glands.

**Neck.**—Normal.

**Eyes.**—Pupils equal, reaction to light and accommodation doubtful. Unable to converge, vision double.

**Throat.**—Pharyngeal and laryngeal muscles relaxed. Tongue moderately coated, is able to protrude it weakly, in midline.

**Hearing.**—Normal.

**Heart.**—Rate 90, regular, auscultation normal. Blood pressure 110-73.

**Lungs.**—Negative.

**Abdomen.**—Complains of tenderness to palpation over whole of abdomen.

**Genito-urinary system.**—Negative.

**Nervous system.**—Patellar reflexes equal and active.

**Laboratory examinations.**—Blood Kahn negative. R.B.C. 4,910,000; Hgb. 85 percent; W.B.C. 6,800; Pmn. 75; Lymph. 22; Mono. 2.

**Urinalysis.**—Appearance, straw clear; reaction acid; Sp. Gr. 1.030; albumin and sugar negative; microscopical—some hyaline and many finely granular casts.

10 a.m.—Patient had difficulty in breathing, and several choking spells, became quite cyanotic.

12:30 p.m.—Tracheotomy done to relieve laryngeal obstruction. Respiration much quieter and easier during the afternoon. Fed through nasal tube.

6 p.m.—Restless and apparently uncomfortable. Does not articulate intelligibly.

9 p.m.—Respiration failing.

9:30 p.m.—Expired, apparently from complete respiratory failure.

**Postmortem findings—Gross.**—The body is that of a white male of forty-odd years apparent age. There is a tracheotomy opening present.

**Head.**—No gross pathology noted in cerebrum, midbrain, cerebellum or medulla.

**Chest.**—No free pleural fluid. Both lungs appear edematous. Heart stopped in systole; no gross pathology noted.

**Abdomen.**—No excess peritoneal fluid. No gross pathological change noted in any of the abdominal organs.

**Microscopical—Lung.**—Shows moderate congestion. Some of the alveoli contain precipitated albuminous material—edema. A number of pigmented macrophages are seen in the tissue spaces. There is moderate congestion and edema.

**Spleen.**—There is moderate diffuse fibrosis. An occasional eosinophile is seen. There is a considerable amount of brown pigment present in the endothelial cells.

**Adrenal.**—Negative.

**Heart.**—Negative.

**Liver.**—The polygonal cells show some granular degenerative changes.

**Kidney.**—Shows an acute congestion with granular degenerative changes of the epithelium.

**Pancreas.**—Negative.

**Brain.**—Cerebrum and cerebellum appear normal.

**CASE 2.**—D. M. N., civilian, out-patient, not admitted to the hospital. During the night of November 28–29, N. had some gastric distress. Felt perfectly well in the morning, however. Continued feeling well until the afternoon of November 30, when he noticed blurring of vision and slight diplopia. No other symptoms noted until December 2, when he noted a "thick tongue." Tongue felt relaxed, as if it had fallen apart and he could not draw it together. Throat felt weak. Could not swallow well. Could not manipulate food. Choked a little on swallowing and found he had to wash down food.

Phorometer readings December 2: 18° esophoria at distance, 12° esophoria near.

December 3—Extreme dryness of mouth developed, as if a current of hot air were blowing up from throat parching mouth. He had a bitter, disagreeable taste in mouth. Saliva was scanty, thick, and mucoid. Calves of legs began to feel sore and feet heavy. Phorometer readings as on December 2.

December 4—Loss of power in hands, particularly weakness of thumbs, was noted. Noted increased difficulty in walking, especially up grade, due to weakness of entire leg. Pressure on calves painful.

December 5.—Neck felt very weak. Could hold head erect, but, if he inclined it, head fell forward and had to be supported with hands. Phorometer reading: 16°, Esophoria P.R. (distance), 12°, Esophoria P.P. (near).

December 7.—Constipation became pronounced. Bowels had moved well until this time.

December 8.—Noted hand was so weak that he could not hold telephone receiver to ear. Appetite good.

December 9 to 16—Symptoms persisted as above. Felt well, though weak, as long as he was in bed. Diplopia disappeared about the 16th.

December 17 to 23.—Quite weak, although he feels he is improving. Diplopia returns on fatigue. He lost 15 pounds in weight since onset of illness.

January 17, 1933.—Phorometer reading: 14°, Esophoria P.R., 10°, Esophoria P.P. Symptoms persist as above. No diplopia except when fatigued.

February 14.—Phorometer reading: 12°, Esophoria P.R., 8°, Esophoria P.P. Much improved in muscular strength and coordination. Feet and legs still tire easily. Hands still weak, thumbs most noticeably so. Bitter taste in mouth still returns occasionally, especially when he becomes hungry. Muscles in back of neck are somewhat sore and quite susceptible to chilling. Still tires easily and perspires quickly on exertion. Voice, which has been husky and weak, is getting stronger. Double vision at extreme angles. Constipation persists to some degree. Reflexes present but sluggish throughout the course of the disease.

It is believed that the phorometer readings given above indicate no definite paralysis of any of the extrinsic ocular muscles but marked weakness. As the internal rectus normally has a 3 to 1 ratio in strength over the external rectus, diplopia and marked esophoria resulted from the loss of power even though all muscles were affected equally.

Investigation of the dietary of the McB. family and guests revealed the following: November 26, 1932—Present Mr. and Mrs. McB., their two sons and Mr. N.

*Breakfast.*—Stewed prunes, oatmeal, eggs—soft boiled.

*Lunch.*—Boiled potatoes, peas (commercial can S), well boiled while preparing, spinach (commercial can D), well boiled while preparing, tomatoes (fresh), milk (fresh).

*Supper.*—Present, the above five, Mr. and Mrs. E. and daughter. Turkey soup (well boiled), containing turkey, carrots (fresh), tomatoes (fresh), beans (canned, S brand), peas (canned, S brand), parsley, celery; biscuits, rolls, potato chips, jelly cookies.

#### November 27

*Breakfast.*—Present, the above eight. Rolls, bacon, eggs, fig jam, prunes (fresh stewed).

*Lunch.*—Present, the above eight. Pork, fresh, roasted; potatoes, mashed; peas, canned S brand; chutney, home made; grapes, home canned; olives, home canned; cake, and cheese.

*Supper.*—Present, McB. family and Mr. N. (5). Potato cakes, roast pork, fried quail, potato chips, sliced tomatoes, cookies, cake, tea.

Up to this point all present had partaken about equally of each article. In addition, Mr. McB. and Mr. N. ate some turkey soup, reheated and well boiled. It had stood since the previous day in the pantry.

#### November 28

*Breakfast.*—Present, the above five. Oatmeal, eggs, milk, coffee, bread.

Mr. McB. and Mr. N. also ate each a dish of home canned figs; these figs were put up with very little sugar. Neither man noticed anything wrong with the figs.

*Lunch.*—Mr. and Mrs. McB. lunched in San Diego, at the home of Mrs. S. Menu—Hamburger steak, potatoes, peas, sliced tomatoes, cottage cheese, apple pie, tea.

At the ranch, Mr. N. and the two McB. boys ate: String beans (S brand), spinach (D brand), mashed potatoes, pork gravy, cookies.

*Supper.*—At ranch. Present, the McB. family and Mr. N. Potato chips, corned beef, spinach, ice cream, cookies, jelly eaten by the McB. family only. Bread and milk eaten by Mr. N.

In examining the above dietary, our suspicion rested particularly on the warmed-over turkey soup and on the home-canned figs because those were the two articles which the two men had eaten in common and which none of the others had eaten. Samples of all home and commercially canned foods, either those eaten or from the same commercial pack, were obtained with the exception of the home-canned figs eaten at breakfast the 28th by the

two men. Samples from other jars preserved at the same time were, however, obtained. These were all examined in our laboratory both by culture and by filtration and animal inoculation of the bacteria-free filtrate with entirely negative results. A number of these articles were examined in the county public health department laboratory, also with negative results.

The small amount of figs remaining from the jar partaken of by Mr. McB. and Mr. N. on the morning of November 28 had been thrown out. The dump where this was said to have been thrown was searched without success. We were later informed that a hen which had been running outside of the chicken yard had died 2 days following this of typical "limber neck", fowl botulism. Presumably the hen had found the fig remnants before we searched for them.

#### SUMMARY

Botulism is a disease characterized by an afebrile course, weakness or paralysis of the voluntary muscles, and a high death rate. It is due to the ingestion in food of a neuromuscular exotoxin produced by the anaerobe *Clostridium Botulinum* (*Bacillus Botulinus*).

Two cases of botulism are reported, 1 fatal, 1 nonfatal, caused by the ingestion of botulinus toxin in home-canned figs (not proven bacteriologically). These two cases illustrate well the epidemiology, symptomatology, and pathology of botulism.

The history, bacteriology, symptomatology, pathology, diagnosis, prognosis, and treatment of botulism are reviewed.

It is suggested that sodium amytal be tried in the treatment of the disease.

#### REFERENCES

- Botulism—Cecil, Textbook of Medicine. 2d ed., p. 533, W. B. Saunders—Philadelphia.
- Botulism—E. O. Jordan, M.D. Encyclopedia Britannica, 14th ed., 1929.
- Botulism—E. C. Dickson. Monographs of the Rockefeller Institute for Medical Research No. 8, 1918.
- The Epidemiology of Botulism—Geiger, Dickson, and Meyer. Public Health Bulletin No. 127, 1922, U.S. Public Health Service.
- Cultural Study of an International Collection of *Clostridium Botulinum* and *Parabotulinum*. XXXVIII—J. B. Gunnison and K. F. Meyer. The Journal of Infectious Diseases, 45: 119 (Aug.) 1929.
- Spider Poisoning: A study of the Toxin of the Black Widow Spider—Hall and Vogelsang. U.S. Naval Medical Bulletin, 30: 471 (Oct.) 1932.
- A successful Treatment for Strychnine Poisoning—Kempf, McCallum, and Zervas J.A.M.A. 100: 548 (Feb. 25) 1933.

**SPINAL ANAESTHESIA, PHYSICAL AND PHYSIOLOGICAL CONSIDERATIONS**

By JOSÉ LONDRES, Lieutenant, Medical Corps, Brazilian Navy

Leonard Corning, American surgeon, succeeded in 1885 in interrupting the flow of nervous impulses along the spinal cord, by injecting, after laminectomy, a solution of cocaine between the spinal processes of the last dorsal vertebrae. It was only after Quincke had performed a lumbar puncture in man, thus opening the way to the study of the spinal fluid, that Corning conceived the idea, in 1894, of repeating on man the identical experiment he had successfully performed on animals.

Corning's purpose was an exclusively pharmacologic one. He aimed to ascertain to what extent medicinal substances introduced into the spinal canal were absorbed. The anaesthetic phenomena brought about with the cocaine solution used by him corroborated his theories completely.

In 1896, Bier, in Germany, wishing to amputate the foot of a patient unable to take inhalation anaesthesia, recalled Corning's experiments and injected into the dural sac of his patient a 0.5 percent solution of cocaine. A few minutes later Bier was able to carry out the operation without pain. The enthusiasm which followed was so great that Bier ordered his assistant Hildebrandt to anaesthetize him, in order to appreciate in all their details the several phases and changes undergone, but unsatisfactorily described, by the patients anaesthetized by the new method.

Months later Tuffier, in France, ignorant of the work of Bier, performed a spinal anaesthesia under identical conditions.

The new method of anaesthesia was thus definitely introduced into surgery. With its roots implanted in the United States, Germany, and France, it quickly spread over the world, undergoing, during the almost 40 years of its existence, alternate periods of prestige and discredit. It is no longer in use in Bier's clinic; many of those who defended it with enthusiasm today deny its virtues; some became its ardent supporters, while others, although they have not abandoned it entirely, have narrowed considerably the field of its application.

Spinal anaesthesia gives rise to functional disturbances of two kinds: (1) Changes due to the spinal puncture, and (2) changes depending on the anaesthetic itself.

Among the former we have (*a*) lesions caused by the needle, to which have been ascribed, unduly at times, various functional disturbances, and (*b*) disturbances due to the change of volume of the spinal fluid. If we consider the puncture used for an ordinary spinal anaesthesia, that is, a low spinal puncture, between the third

or fourth lumbar spaces, the danger of lesion of the cord or of the nerve plexus no longer exists, since at this height the subarachnoidal space is occupied by the nerves of the *cauda equina*. At this level spinal anaesthesia is nothing more than a trunk anaesthesia. The progress of regional anaesthesia has shown that there is no lasting disorder due to the lesion of the nervous rami, from their penetration by the needle. The cord ends at the level of the second lumbar vertebra, and the puncture performed above this limit may give rise to more or less permanent changes, if they should happen to cause a lesion of the posterior nerves.

Among the changes of the second group, we have disorders, of various duration, due to alterations in cerebro-spinal pressure.

It has often been noticed that the opening made in the meninges by the needle remains after the latter has been removed, causing a slow but continuous extravasation of the fluid, which seeps into the epidural spaces. The hypotension thus produced is the cause of the phenomena felt as a rule by the patient, due to the meningeal hyperemia, (Ossipow and Reichmann), headaches, nausea, and fainting spells. These disturbances although positively encountered, are not fully understood, for, as Laborde says, the hypotension is transitory and soon gives way to hypertension determined by the excess production of a compensatory fluid by the choroid plexus.

In mentioning these factors our purpose is to avoid having the anaesthetizing agent made responsible for the appearance of disorders, albeit slight, due to the puncture itself.

Once we have thus set to one side the disorders caused by the puncture, let us see what conclusions we can gather from the study of the relationship of the anaesthetizing agent and of the spinal fluid, in the spinal canal.

We shall start from the law laid down by Forgue: "The height of the analgesic zone is inversely proportional to the resistance of the mass of the fluid." Let us see what this means. It means that the higher the anaesthesia is performed the less tense the fluid contained in the sub-arachnoidal space, or, conversely, the lower the zone of anaesthesia the greater the tension of the fluid. Whence, hypertension is equal to the transverse anaesthesia of the lower segments of the body, and hypotension is equal to the transverse anaesthesia at a higher level.

How are we to explain this difference in height of the analgesia for a given anaesthetic? Pech and Delmas have tried to explain it, with conclusive experiments, by the mechanism of *diffusion*, which we shall now describe.

Three test tubes are filled with water and closed by a rubber membrane. Into the first, and through the rubber, a small excess of

water is injected, thus causing the membrane to bulge out as a convex surface; in this tube we have, therefore, hypertension. From the second tube, and by the same method, we extract a little of the fluid, the rubber membrane of which is drawn in, forming a concave surface: the water in this tube is in a state of hypotension. Finally, the third tube is left untouched. We now turn the three tubes upside down, that is, with the rubber membranes on the lower side, and we inject into the first a small quantity of a solution of methylene blue: the coloring solution will remain at the place where it was injected. We do the same to the second tube (hypotension): the coloring quickly spreads into the interior of the tube, mixing with the liquid. Finally, if we repeat the procedure with the last tube, we shall see that the coloring solution rises gradually into the fluid, in successive layers, the intensity of the diffusion being intermediate to that observed in the other two tubes.

If we change the tension of the liquid the height of the last segment of the cord reached by the inhibitory anaesthesia will also vary. We have at first an inhibition of the vaso-constrictor centers, with a drop of arterial pressure, which of itself may bring about a syncope; then the respiratory, cardiac, and vasomotor centers will be involved, a complication which, even if it is not followed, as it frequently is, by death, is sufficiently spectacular to alarm considerably those who are following the development of the intoxication process.

Under normal conditions, however, the withdrawal of a certain amount of fluid gives rise to diffusion at a certain height, so that some authors, as for instance Le Filliatre, advise the withdrawal of from 25 to 30 cc, an amount which Forgue considers dangerous; 10 cc, at most, is the amount advised by the Montpellier University professor, as being just enough to allow a reasonable diffusion, a homogeneous mixture, without the high infiltration of the anaesthetizing agent.

It is true that an exceedingly high anaesthesia has been frequently obtained, as high as a collar bone, without untoward results. The comparative frequency of such cases has led many surgeons to forget the teachings of physiology and to anaesthetize the upper portions of the cord. René Bloch says: "One may carry the anaesthesia just as high as wanted, and no further."

Realizing as we do the seriousness of the analgesia of the respiratory and cardiac centers and given the impossibility at this time of controlling the upward progression of the anaesthetizing agent, either because the tension of the fluid is modified by several factors, or because the amount of the anaesthetic cannot be made the same for every individual, we are forced to admit that spinal anaesthesia, in the eyes of those who want to know the intimate mechanism of the

phenomena of life, has this important disadvantage; that, in the event of appearance of the unmistakable symptoms of an intoxication of the upper segments, the surgeon has at his disposal no means whatever with which to stop its progress.

If, in the course of inhalation anaesthesia, a toxic symptom should develop, the withdrawal of the mask is equivalent to the stopping of the anaesthetic, whereas in spinal anaesthesia, which has required the introduction, into the medullary canal, of a massive dose of the chemical agent, once the first symptoms of inhibition of the upper spinal centers appear, all that can be done is to await the march of events, in the impossibility which obtains of putting a stop to the absorption of the entire amount of anaesthetizing substance injected.

In addition to the uncertainties inherent to the facts just mentioned, if we wish to go a little deeper into the physiology of spinal anaesthesia, we shall realize that the infiltration of the upper layers is further dependent on a large number of additional factors, which tend to make the line of demarcation even more difficult to determine.

The experiments of Pech and Dumas have brought home to us in a clearly condensed manner the importance of *diffusion* which, due to several reasons into which we shall not delve at this time, does not comply with the laws of physics governing the free diffusion of fluids.

The effects of gravity have also been suggested, as a factor capable of determining the level of the anaesthesia. In this connection we must take into account the position of the patient and the specific gravity of the anaesthetizing solution. We would thus be led to think that the Trendelenburg position would inevitably bring about an involvement of the upper medullary centers, a supposition not borne out by the facts. The explanation of this fact is that the subarachnoidal space and the ventricles are filled with fluid, and we know that if we shake a container which is closed and entirely filled with fluid, the fluid does not move.

This explanation is not accepted by all authors, and especially by those who believe that the column of the spinal fluid, as well as that of the venous system, is subject to the action of gravity.

The movements of the fluid might also be considered additional factors of the level of infiltration of the anaesthetic.

At first it was believed that the spinal fluid was animated by a circular motion, or return flow, and that there was a cerebrospinal, as well as a spino-cerebral, current. It has been proven that things take place in a different manner.

The fluid forms in the chorioid plexus, fills the cerebrospinal cistern and the lakes of the base, then the subarachnoidal spaces up to the lumbo-sacral fundus. This fluid mass, however, is renewed



about seven times every 24 hours, the flow taking place by the venous and lymphatic routes. The result is that the flow of the contents of the medullary canal is exceedingly slow and follows a downward direction, there being also a to-and-fro movement, caused by the cerebral dilations. In view of these facts, we may draw the conclusion at this time, that the flow of the cerebrospinal fluid has no effect on the march or on the ascent of the anaesthetizing agent.

Finally, we must examine the existence of a possible neurotropic action. Neurotrophism alone can explain the fact, very often noticed, of a considerable difference in the height of the zone of anaesthesia, in spite of the constancy of both technique and dosage. Only a neurotropic action can explain, furthermore, the more or less well-defined limit of the anaesthesia, whereas it might be very logically expected that, once the anaesthetizing solution becomes homogeneous with the fluid, the process of insensibilization would extend to the entire neuraxis. The variations noted, therefore, should be attributed to a neurotropic action of the anaesthetizing substance on the nerve centers, differing from one individual to another. The anaesthetizing agent introduced into the subarachnoidal space would begin by impregnating the nervous tissues lying in the lower parts, and would go up gradually. As the fixation of the chemical agent gains in height, the solution loses a corresponding amount of the same agent, until, at a given point, the anaesthetizing action ceases completely. This supposition does not, it is true, explain the accidents due to high infiltration, which takes place immediately following introduction of the anaesthetizing solution, before anaesthesia of the lower segments.

As a general rule, however, and so far as neurotropism is concerned, the level and the duration of anaesthesia, for a given anaesthetizing agent, depend on the quantity of the substance administered and on the power of absorption of the nervous tissue of the individual under consideration.

#### GRAVITY CONTROL METHOD OF GIVING SPINAL ANAESTHESIA

By RUDOLPH D. JOLDERSMA, Lieutenant Commander, Medical Corps, United States Navy

For the past 2 years I have been using a gravity control method of giving spinal anaesthesia that has eliminated the routine use of ephedrine and has almost entirely done away with the drop in blood pressure and resultant shock which were so common with the methods I previously used.

Immediate death from spinal anaesthesia is caused by respiratory paralysis. Respiratory paralysis can take place in two ways, first by the action of novocaine directly on the medullary center of respi-

ration by diffusion of the drug to the fourth ventricle. Work of Johnson and Henderson (1) and Koster and Kasmar (2) demonstrated experimentally that excessively high dosage was necessary to cause this. Second, a severe drop in blood pressure causes an insufficient flow of blood through the respiratory center. Since the respiratory center cannot properly function without a sufficient supply of oxygen and nearly all fatal cases have an extreme drop of blood pressure, this probably is the most important cause of respiratory failure.

Nearly all authors claim paralysis of splanchnic nerves and pooling of blood in the abdomen as the cause of the fall in blood pressure. Kemer and Wright (3) and others have shown that bilateral section of splanchnic nerves produce only a fall of 0 to 15 percent in blood pressure. Also personal observation of bloodless contracted intestine and blanched uterus, when you open an abdomen under spinal anaesthesia is ample proof that all the lost blood is not there.

Ferguson and North (4) showed that if the white rami below the diaphragm are involved up to tenth thoracic segment, only an average 10 percent fall occurs and if the thoracic white rami are involved a further 30 to 40 percent drop occurs.

Now, let us remember a very significant fact, if all the thoracic white rami are involved then we also have intercostal nerve involvement and thoracic paralysis.

Gray and Parsons (5) in 1912 drew a conclusion, "The main fall is due to costal paralysis which is not compensated for by overaction of the diaphragm and consequently aspiration action of the thorax is diminished. Isenberger and Lundy (6) observed, "Artificial respiration by alternate inflation and deflation of lungs with positive and negative intrapulmonary pressure, would maintain a nearly normal blood pressure in dogs after complete paralysis of the spinal cord by large doses (2,500 mg) of procaine intradurally." Servers and Waters (7) report, "Artificial respiration alone with the Drinker respirator using alternate positive and negative pressure, will maintain blood pressure near its original level after either a block completely paralyzing all respiratory activity or section of the cord at a corresponding level."

These last two observations then indicate that if involvement of all thoracic segments occur, the heart will remain competent, even though the whole vascular bed is dilated, provided fairly normal respiration occurs and sufficient pulmonary interchange of gases occur. True, when we get a thoracic paralysis and failure of proper exchange of gases (anoxaemia), this anoxaemia not only effects the respiratory center but also further reacts on the cardiovascular system and causes further embarrassment of this already toneless, de-

pleted system. This vicious circle is probably the cause of deaths in spinal anaesthesia.

We conclude then, that involvement of up to the tenth thoracic segment will give us very little if any adverse reactions, and we now turn to a description of how to control accurately the height of the anaesthesia by this gravity-control method.

Spinal fluid has a specific gravity of about 1.006. If 50 milligrams of novocaine are dissolved in 1 cubic centimeter of spinal fluid, the specific gravity of this resultant solution will be about 1.012 or approximately 0.006 higher.

If 200 milligrams of novocaine is dissolved in 4 cubic centimeters of spinal fluid and this is injected very slowly, 5 seconds to each cubic centimeter with patient sitting up or lying on his side, and the head of the table elevated; the solution should gravitate down into the caudal end of the canal. If the patient is placed on his back and a pillow is placed under head and shoulders an angle will be produced in the spinal canal at or just above the diaphragm and prevent the heavier solution from going any higher, even if head of table is slightly lowered. If the table is placed level the anaesthesia level is checked. If it advances too slowly the head of the table may be put down slightly. The pillow under head and shoulders protect us from its going too high. As soon as the proper level of anaesthesia is reached, the head of the table is placed level or slightly up to keep the solution from going higher and involving the costal segments. One important point here is that due to the heavier specific gravity the solution flows along the posterior part of the canal and so anaesthetizes the posterior roots first. If you check carefully you will find the sensory anaesthesia is always in advance of the motor anaesthesia. When you elevate the head of the table and stop the upward flow, the sensory anaesthesia is always well in advance of the motor involvement.

There are two methods of proving this gravity control actually takes place. Take a burette and connect a small piece (1 inch) of rubber tube at the bottom with a small glass tube sealed at one end. Fill the burette with sugar solution 1.005 specific gravity colored red. Close the burette tight at the top with a cork. Now take 4 cubic centimeters of the same solution specific gravity 1.012 colored blue, stick the needle into the rubber tube and inject very slowly. The heavier solution will sink into the small dependent tube (our caudal end of the canal). Then tilt the burette gradually on its side and the blue solution will flow along the posterior wall.

Take 2 cubic centimeters of spinal fluid and dissolve 100 milligrams in it and with needle in third lumbar space and with a patient sitting up, inject the solution very slowly into the spinal canal.

Keep the patient in the sitting position and you will obtain saddle anaesthesia and no involvement of the lower extremities. Place the patient on his side and elevate the head of the table about  $15^{\circ}$  then dissolve 150 milligrams of novocaine in 3 cubic centimeters of spinal fluid and inject very, very slowly. Allow the patient to turn slightly back toward his back and put a pillow under upper hip. You will get anaesthesia of the dependent extremity, not the upper extremity. With a patient sitting, inject 200 milligrams dissolved in 4 cubic centimeters of spinal fluid very slowly. Keep the patient sitting up about 4 or 5 minutes and check level of anaesthesia. Then allow the patient to lie on his back on a level table with a pillow under the head and shoulders and the height of the anaesthesia will rise.

As a routine method we inject all patients lying on their side with the head of the table elevated. The solution is injected *very* slowly, 5 seconds to 1 cubic centimeter, and patient turned on his back with a pillow under the head and shoulders. The table is horizontal or not, depending on the height of anaesthesia desired. We use for rectal or pelvic work 100 milligrams in 2 cubic centimeters of spinal fluid, head of table up  $15^{\circ}$ . Lower extremity or hernia 150 milligrams in 3 cubic centimeters and table about horizontal. Appendectomy or middle abdomen 200 milligrams in 4 cubic centimeters of fluid. Table horizontal. Gall bladder or stomach 300 milligrams in 6 cubic centimeters spinal fluid. Table horizontal. Head of table is depressed about  $10^{\circ}$  or  $15^{\circ}$  and level of anaesthesia noted. Pillow under head and shoulders is always used. As soon as the level of anaesthesia is high enough table is placed horizontal or the head of the table is elevated.

As a check on motor involvement of chest we ask the patient to take a deep breath occasionally and as soon as he complains of a slight feeling of weight on lower chest, we elevate the head of the table immediately as we know we are getting intercostal involvement. As long as the patient breathes well, rarely if ever have we had a drop in blood pressure. Ephedrine is not used except in cases showing embarrassment. By this method it can readily be seen it takes longer (5 to 10 minutes) to get our level of complete anesthesia, as our solution gravitates slowly but surely. Patients are returned to the ward and placed in bed with head and shoulders elevated.

If we have a drop in blood pressure and adverse reaction, what treatment should be instituted?

1. Ephedrine to increase vascular tone, and so assist the heart.
2. Artificial respiration with pure oxygen.  $60_2$  is contraindicated here.

3. Trendelenberg position is contraindicated, as no matter what the dilution of solution injected, it is of a heavier specific gravity and if it is not all fixed it will involve the higher thoracic segments. Also the weight of abdominal viscera against the diaphragm, our only respiratory hope, interferes with its action, compresses the chest, and prevents adequate respiration and ventilation of the lungs.

4. Intravenous injection of normal saline solution to increase volume of blood.

#### CONCLUSION

That the primary cause of the drop in blood pressure during spinal anaesthesia is anoxaemia. If careful attention is paid to maintaining proper respiratory function this severe drop in blood pressure and resultant cerebral anaemia can, in nearly all cases, be avoided.

#### BIBLIOGRAPHY

- (1) Johnston and Henderson. Anaesthesia and Analg. March 1932.
- (2) Koster, H., and Kasman, L. P. S. G. and O. November 1929.
- (3) Kremer and Wright, Quart. J. Exper. Physical 319. 1932.
- (4) Ferguson and North—S.G. and O. April 1932.
- (5) Gray and Parsons, vuart. J. Med. April 1912.
- (6) Isenberg and Lundry, Proc. Staff Meeting Mayo Clinic. April 1932.
- (7) Seevers and Waters, Jour.A.M.A. September 17, 1932.

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#### THE RELIEF OF PAIN AND DISCOMFORT FOLLOWING TONSILLECTOMY AND SUBMUCOUS RESECTION

By FRANKLIN F. LANE, Lieutenant Commander, Medical Corps, United States Navy

The first symptom following tonsillectomy in the adult, whether done under general or local anaesthesia, is pain. The second most constant symptom is the discomfort caused by quantities of thick, stringy, blood-stained mucous and saliva, which induces volitional or reflex swallowing with its accompanying pain, and in high-strung, nervous individuals fear of the dread post-operative hemorrhage. In some cases this fear is sufficiently great to overcome the influence of morphia. Patients force themselves to stay awake all the night following operation watching for any increase of blood in their expectoration or, if the room is dark, awaiting a sudden gush of blood into the throat.

This watchfulness prevents the swallowing of blood and its attendant nausea and calls attention early to a serious hemorrhage. When, however, it reaches the point of causing loss of sleep and elevation of blood pressure from physical exertion and mental strain it is time to call a halt.

The first of these complaints—painful swallowing—can be practically eliminated particularly at mealtime, by the use of the following powder spray used with the precautions noted.

Rx Aspirin powder	grams	100
Tannic Acid powder	do	1.5
Menthol crystals	do	.5

Grind up together in mortar. Keep tightly stoppered and dry. Use in a powder blowing hand atomizer.

The first precaution is to apply a very thin film. The tonsillar fossa should be free of blood but otherwise moisture assists in the action. The bulb of the atomizer should be squeezed by small quick compressions moving the nozzle of the atomizer rapidly over the area so that all raw surface is covered. The fossa should then have a pinkish-white appearance and not dead white. Too heavy a coating causes intense burning and an increased flow of sticky saliva for several minutes. Used as described there is a very mild burning which disappears within a few seconds and in a few minutes semisolid food may be swallowed with entire comfort. I speak not only from observation of its use since 1926 in several hundreds of cases, but also from experience with its use in my own throat following tonsillectomy. The effect lasts about an hour. The spray may be used once between meals and once at night the first 2 or 3 days. There is such quick relief that the patient demands the powder every time the throat feels a little raw but there seems to be some tolerance developed by more frequent use and by the second day its effects will be almost nil if used ad lib. This is then the second precaution; do not use too often. Used only 5 or 6 times a day, and tapering off as circumstances permit, the analgesic action continues until there is no longer any need for it.

Those who try to ease this pain with orthoform, aspirin tablets, or other relief remedies will find that this powder, used as described, will give results not obtained before. It will be necessary, however, to instruct the nursing personnel in its proper use. It will be found that the time given to this instruction is well spent.

When a mild hemorrhage does occur or continues, and no definite bleeding point can be seen, the use of the aspirin-tannic acid-menthol powder spray will be found very effectual for such a general ooze.

The second symptom—blood stained mucus and worry is reduced to a minimum by preventative measures.

With nervous individuals take plenty of time to see that all bleeding or oozing points have been stopped by pressure, clamping, or ligature before the patient leaves the chair. Spend 10 minutes on each fossa if need be and the result will justify the time.

When finished, if the fossa is coated with bismuth subnitrate powder blown from a hand atomizer several advantages will be found; it gives a white background on which any bleeding point will show clearly; it has a soothing effect on the raw tissues; and its mild astringency reduces the amount of post-operative saliva and oozing.

Upon return to bed the patient is placed on the abdomen or on one side with the upper knee flexed and the lower knee straight. Either arm, if on the abdomen, or the under arm if on the side is placed just above the head beneath the pillow. The mouth is turned downward over a pus basin on the mattress in a hollow punched in the pillow. The patient is told to breathe through the mouth; not to raise up to spit; not to swallow but to allow the saliva to drool out of the corner of his mouth into the basin; and not to assist expectoration by moving his lips, his cheeks, or his tongue. At first these instructions are sometimes hard for a fastidious individual to carry out, but watchful nursing soon corrects this.

The more phlegmatic individuals, once the arms and head are comfortable, will be asleep in half an hour with their mouths open and the saliva running into the basin.

The very restless or nervous individual may be given morphine and atropine at any time their condition seems to warrant it and all, unless asleep, are given a hypo after 9 p.m., repeated once after 4 hours if necessary during the night.

For the medical officer who dislikes to cause pain and the increased trauma attendant upon stopping post-operative hemorrhage after the anaesthesia has worn off, these three points of routine will be found to be a great relief.

Intranasal operative cases, especially submucous resections, are subject to pain and discomfort postoperatively when anaesthesia wears off and there is an uncomfortable nasal packing, mouth-breathing, oozing, headache, and pain in the eyes with lachrymation.

The following method of minimizing this pain and discomfort following submucous resection has not been published before, I believe.

A piece of pink dental paraffin and wax (Supply Table No. 25-051) 6 by 3 inches is used in northern climates and Caulk's paraffin and beeswax "extra tough" pink dental base-plate wax is used in the Tropics or during extremely hot weather in this country. The melting point of supply table wax is lower than Caulk's and therefore in hot weather it does not harden sufficiently in the nose to give the good firm pressure required for hemostasis. This piece is cut in half after soaking in hot water and then one of these halves cut again in half, this time somewhat diagonally so that one end of each quarter will be about two thirds as wide as the other end. This piece is then folded lengthwise, the edges smoothed by pinching or rubbing

with the handle of the scissors and inserted, the small end first into the nares, with the cut edges up, while still warm. A pair of broad flat billed septum forceps is inserted between the folds and the wax fashioned into a tube, open above, by opening the forceps and forcing the wax to conform to the nasal topography. Care must be used to open it to the posterior extremity so that normal nasal breathing is established through the tube thus formed. By the time the second piece is folded and inserted in the opposite nostril the first will be fairly well set and the second piece may be opened and pressed into place without fear of disturbing the first too much. With these two intranasal splints in place and opened there should be normal nasal breathing on each side; bleeding should be controlled and the danger of intramucosal haematoma minimized. The splints should be long enough to extend about one half an inch beyond the tip of the nose. In noses short in their anterior-posterior diameter the wax will have to be cut off externally and in those long in this axis the splints will have to be lengthened by cutting the original wax sheet the proper length. In noses that are very high more than a quarter of the original sheet of wax will have to be used. In other words the nasal cavity and particularly the septal wall must be covered by the wax as much as the individual irregularities will permit, trimming and shaping here and there for comfort, but never at the expense of the covering for the septal mucosa.

If bleeding is not controlled, the regulation  $\frac{1}{2}$  or 1-inch vaseline gauze-packing strips may be inserted in the wax tube tightly enough to control one side or both. If at anytime within the next 24 hours bleeding becomes excessive this packing may be done almost painlessly by grasping the protruding edge of the wax with the thumb and forefinger and making counter traction as the gauze is pushed in.

Of course if packing is necessary then the comfort of nasal breathing is lost but there is less pain and discomfort from the pack because the pressure is distributed evenly over a rather large area and not irregularly at different small points of contact as with the gauze packing alone.

The next morning the accumulated secretions of the night lubricate this splint so well that, after any gauze packing, there may be, has been slowly and gently teased out of the wax and the tube squeezed together externally with forceps the splint slips out almost painlessly and with very little if any bleeding. If the tube has been packed and the external wall has not been thoroughly covered with wax the gauze may stick to a turbinate and when pulled away result in bleeding but this should not be large in amount nor of long duration. Do not leave in over 24 hours as the upper wax edge may cause an erosion from pressure on a turbinate.



I have used this method as a routine since 1927 in all intranasal work requiring immediate pressure control of hemorrhage and the results in comfort to the patient and for the peace of mind of the operator are so marked that I believe his method worth reporting. A little practice and observation of the area to be covered will make this seemingly tedious procedure very simple and a piece of wax the right size and shape can be fashioned the first try, needing only minor clipping here and there for comfort. After the first 10 or a dozen cases the excess time required will be far outweighed by the results obtained.

#### SUMMARY

1. The aspirin-tannic acid-menthol powder spray when used before meals as described will give great ease and relief of pain in swallowing and is effective in controlling minor general oozing post-operatively.

2. Bismuth subnitrate powder spray as a final dressing for tonsillectomy seems to have some beneficial effect in post-operative oozing and comfort.

The prone position in bed after tonsillectomy with the drooling of saliva into a basin not only gives relief from the pain of swallowing the saliva but also serves as an easy method of observing an excessive bleeding from a throat which is not irritated by spitting and coughing and prevents the nausea which follows the swallowing of blood.

3. The dental wax intranasal splint "tailor made" as described, has the following advantages over vaseline gauze alone, Simpson's splints, hard rubber fenestrated tubes, or any other method that I have tried for control of post-operative nasal hemorrhage. It gives uniform constant pressure from each lateral wall toward the septum reducing bleeding and intramucosal haematoma and increases the comfort of the patient.

It allows the patient almost normal nasal breathing and does away with the discomfort of drying of the mucous membrane from mouth breathing when the packing can be omitted. One side or both may be packed at any time post-operatively with a minimum of pain. The following morning the gauze packing comes out easily and without any distressing hemorrhage and the wax itself slips out painlessly and bloodlessly.

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#### CONGENITAL ABNORMALITIES OF THE KIDNEY, URETER, AND BLADDER— A REPORT OF 10 CASES

By M. S. MATHIS, Lieutenant Commander, Medical Corps, United States Navy

In 500 complete urological examinations made in this hospital during the past 4 years, 10 were found to have congenital abnormalities of the kidney, ureter, and bladder which were as follows:

1. Double kidney with double ureters left side.
2. Solitary kidney with one ureter right side.
3. Double kidney with double ureters bilateral.
4. Double kidney with double ureter left side.
5. Congenital absence of bladder.
6. Horseshoe kidney.
7. Accessory ureter emptying into the urethra.
8. Polycystic kidneys.
9. Polycystic kidneys.
10. Polycystic kidneys.

Cases 1, 2, and 3 are of little interest other than being malformations. Cases 4, 5, 6, and 7 are very interesting and are therefore given in detail. Case 8 had one polycystic kidney removed in another hospital several years before admission. Pyelogram of the remaining kidney resembled that of a tumor rather than a polycystic affair. However, with a definite history of a polycystic kidney having been removed from the opposite side, that diagnosis was made. Cases 9 and 10 were definitely polycystic kidneys with hydronephrosis super-imposed and are of so much interest from a diagnostic point of view they are being made the subject of a separate report.

**CASE 4.**—C. J. McC. Sea. 1 c, U.S. Navy, age 22 years. Hospital No. 31602. Admitted March 13, 1930.

*Chief complaint.*—Passing blood in urine.

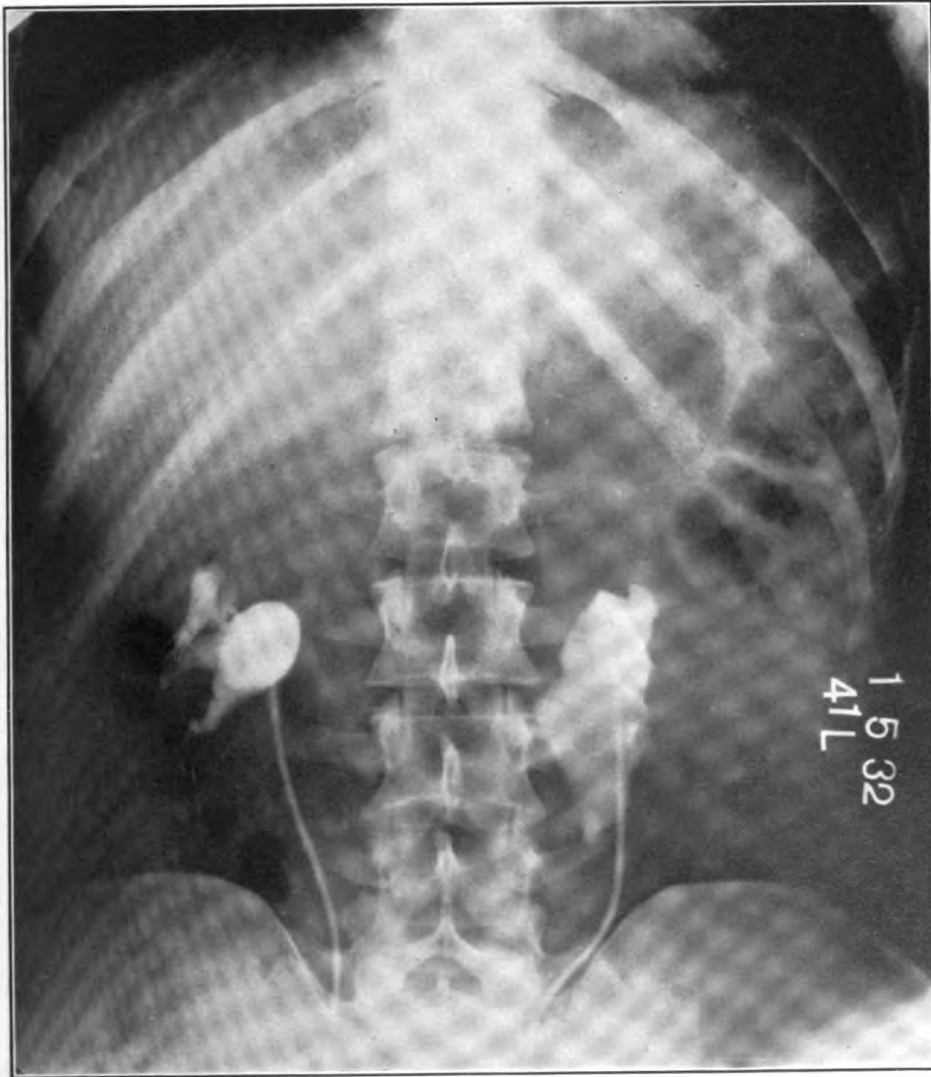
*Family and past history.*—No bearing on the case.

*Present illness.*—February 25, 1930, the patient had a severe chill which lasted about 2 hours. This was followed by a rise in temperature and was accompanied by a slight rash over the chest. The rash continued for about 10 days with moderate itching. During this time he noticed blood in the urine for about 3 days (blood was well-mixed with urine). There was no urethral discharge, dysuria, polyuria, or nocturia. All symptoms subsided until March 6, 1930, when he began having a dragging pain in the lumbar region and under the left costal margin anteriorly. This was accompanied by hematuria, a temperature of 101.0 F. and occasional nocturia of 1 to 2 times a night. There was no nausea or vomiting. The pain was never sharp and did not radiate.

On admission, physical examination was negative except for the following: Marked tenderness in both costo-vertebral angles and a moderate spasticity of the abdominal muscles in the left subcostal region anteriorly. On deep pressure a definite mass could be felt protruding from under the left costal margin anteriorly which was believed to be a kidney tumor. A flat note was heard on percussion from the left fifth intercostal space, midaxillary line, down into the abdomen. Breath sounds were not heard over this area. Expansion of the chest was somewhat limited on the left side. The prostate was normal in size and shape but was indurated to the first degree on both lateral borders. Smear of expressed prostatic secretion showed a few pus cells and a few Gram negative extra-cellular diplococci.

*Urine.*—Moderate trace of albumin, numerous leukocytes, and occult blood.

*Blood Kahn.*—Negative.



HORSESHOE KIDNEY.



## X-RAY OF CHEST AND GENITO-URINARY TRACT MARCH 19, 1930

*Chest.*—Several small calcified areas were seen behind the second and third ribs anteriorly and along the hilus of both sides. The markings of the bronchi were quite prominent. The diaphragm on the left side was a trifle higher than on the right.

*Genito-urinary tract.*—A shadow on the left side emerged from the diaphragm and extended downward to about 2 centimeters above the brim of the ilium. At the level of the upper border of the third lumbar vertebra this shadow was about 9 centimeters in the transverse axis.

*Cystoscopy examination March 19, 1930.*—Cystoscope entered with difficulty because of a tight meatus. No residual urine. Bladder capacity 500 cubic centimeters. The prostatic orifice anteriorly and laterally were normal in appearance. The trigone was markedly inflamed, especially just inside the junction of the right lateral and median lobes of the prostate, where it was hemorrhagic and granular. The right ureteral orifice was retracted under a fold of mucous membrane. Clear urine was seen to come from it. The left ureteral ridge could not be made out. This area gave the impression of being pushed in from without by something, producing a convex surface which was easily depressed. The left ureteral orifice could not be made out but clear urine was seen to come from a slit about 5 centimeters long and 3 centimeters deep high up on the swelling and running transverse to it. A catheter could not be made to enter either ureteral orifice. Above the swelling, mentioned in the trigone region, the bladder again appeared to be pushed in from above and on the left side giving it a lobulated appearance. The mucous membrane appeared normal except as mentioned over the trigone. Cystoscope in bladder and finger in rectum revealed no mass in the bladder wall as high as the finger could reach or in the prostate. The impression was a mass of some kind pushing the bladder in from above and behind on the left side.

April 21, 1930, X-ray report was as follows: In the region of the left kidney there is a very distinct shadow which I believe is a kidney shadow. It is greatly enlarged. It is about 10 centimeters in the transverse axis about the middle and extends to within 6 centimeters of the pelvic brim. Overlying this shadow there is a still greater shadow extending from the lumbar abdominal wall 14 centimeters inward almost to the median line of the body and extending downward to 4 centimeters below the brim of the ilium.

May 1, 1930, P.S.P. in one half periods from time of injection intravenously: 1st, 1 percent; 2nd, 17 percent; 3rd, 6 percent; 4th, 7 percent. Total 31 percent for 2 hours.

May 7, 1930, a right kidney was demonstrated by X-ray for the first time,

May 20, 1930, blood count: R.B.C., 3,750,000; W.B.C., 11,600; hemaglobin, 70 percent; color index, 0.9; polymorphonuclears, 65 percent; lymphocytes, 33 percent; mononuclears, 1 percent; eosinophiles, 1 percent.

Up until May 19, 1930, there was no change in his condition other than the tumor mass in the left side slightly increased in size and pressure over it produced pain deep down in the pelvis on the left side. On this date he was granted liberty, during which time he had sexual intercourse. The following day there was a urethral discharge, a smear of which showed Gram negative extra-cellular diplococci. On May 21, 1930, he had difficulty in urination and passed small quantities of blood when attempting to do so. His bladder became distended. On catheterization 800 cubic centimeters of clear urine were obtained. It was necessary to catheterize him twice a day for 3 days. After

the first catheterization the urine was loaded with pus. During this time he ran a septic temperature of from 98 to 103 F. The tumor mass increased in size until May 29, 1930, when it began to decrease rapidly. A pure culture of colon bacillus was obtained from the urine which appeared to be about one half pus during the time the tumor was decreasing in size.

Numerous cystoscopic examinations were made and at each time the bladder appeared to change its contour. June 5, 1930, a number 5 catheter was passed 10 centimeters up the right ureter where it met an impassable obstruction. P.S.P. injected intravenously appeared from it in 8½ minutes.

July 29, 1930, uroselectan was given. The report follows: These films show the greater function to be on the right side. The kidney pelvis, calices, and ureter are outlined quite sharply. There is some blunting of the calices and the pelvis is entirely intra-renal. A slight grade of hydronephrosis is present on the right and the ureter throughout appears to be somewhat more dilated than normal, the point of greatest dilation being about a centimeter above the juxta-vesical portion of the bladder. The position of the right kidney is normal. The left kidney seems to be pushed to the left. The pelvis is of the intra-renal type and is not outlined as satisfactorily as the right side. No uroselectan is found in the ureter. One can conclude therefore from these films, that the function on the left side is considerably impaired. The left kidney, however, can be definitely outlined and medial to it an indefinite mass is made out which may be responsible for the rather lateral position of the kidney. Exploratory operation advised.

Left nephrectomy was done on August 26, 1930. The kidney was found to be double with two distinct ureters. The lower portion, a dense sac measuring 8 by 3¼ inches was drained by a large dilated ureter. The upper portion, measuring 5 by 3½ inches, consisted of a thin cortex with markedly dilated pelvis and calices, drained by a much smaller ureter.

Following nephrectomy there was a retention of urine which required catheterization 2 to 3 times a day for 5 days, the urine being heavily loaded with pus. Convalescence was uneventful until September 6, 1930, except for a rather large amount of bloody serum from the sinus which persisted. At this time his temperature rose to 103.9 F. with no symptoms other than headache. The following day a number of small blood clots were washed out of the wound by irrigation. On September 19, 1930, he had a severe chill which lasted for 1 hour followed by a temperature of 105.4 F. The urine was quite bloody and very foul. On irrigating the bladder it was noted that no blood appeared after the first washing. This condition lasted until September 22, 1930, when a large number of clots were washed out of the wound. Two days later the wound washings and urine were clear and the temperature normal. Mercurochrome injected into the wound was found to pass into the bladder. No urine passed from the bladder into the wound. He continued to have a sinus from the lumbar wound which communicated with the bladder until March 21, 1931. On this day the ureteral stumps were removed, after which recovery was rapid until April 14, 1931, when he had a rather severe attack of pyelitis on the right side which lasted for 6 days. He was discharged May 1, 1931 completely healed, and urine negative.

Reexamination in August 1932 found him symptom free and his urine negative.

**CASE 5.—S. J. R. (VBP). Age 32. Admitted May 8, 1930.**

*Chief complaint.*—Frequent passing of urine and blood in urine.

*Family history.*—No bearing on the case.

*Past history.*—Mumps 5 years of age; broken humerus, right, 9 years of age; gonococcus infection of urethra 17 years of age; bubo left inguinal as a



SMALL LEFT KIDNEY, FILLED BY INJECTION WITH CATHETER PASSED FROM  
BLADDER: DILATED URETER FILLED BY INJECTION THROUGH URETHRAL  
OPENING.

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result of injury 18 years of age. He had no recollection of frequency of urination before going to school. While attending school between the ages of 7 and 15 years he was unable to go a whole period without urinating. After leaving school he worked in a pulp mill where he urinated every 20 minutes. Thinking the work was responsible for his frequency he changed to American Locomotive Shops where urination was about every 1 to 1½ hours. There was no nocturia until the present onset of illness except after eating watermelon when there would be bed wetting frequently. While in the Army between the ages of 21 and 23 he urinated about every hour. When 22 years of age he was hit in the suprapubic region by a baseball. After this he noticed a sharp pain just to the left of the umbilicus when he ran. Urination has always been more frequent when moving about. The quantity of urine passed at one time has always been small.

*Present illness.*—Began 1 month after leaving the Army in 1919. While in church he had a sudden desire to urinate. On attempting to do so only a small quantity passed followed by a small amount of blood. From that time to the present he has had a frequency of every 10 to 15 minutes. Each urination started freely but after a few drops had passed there was a sharp pain along the urethra and the flow would stop. By straining small quantities of urine would be passed, frequently accompanied by blood. On his admission there was frequency of 10 to 15 minutes day and night. He appeared to have severe pain on urination and frequently clear blood (a few drops) followed.

Physical examination revealed carious teeth with marked pyorrhea alveolaris; pupils reacted sluggishly to light and distance; just inside the urinary meatus there was a small superficial ulcer; prostate enlarged, boggy, and tender, otherwise negative.

Cystoscopic examination failed to give any information, as no normal landmarks could be made out. A cystogram was then made by injecting 27 cubic centimeters of 12½ percent sodium iodide which produced severe pain in the left kidney region. The report follows: "An attempted cystogram with sodium iodide fails to show any shadow which can be considered suggestive of a bladder outline. A left-sided ureter can be noted and the iodide has passed up into the kidney pelvis giving a fairly good pyelogram. The left ureter is larger than normal and seems to follow a normal course. On the right side no definite evidence of a ureter can be made out. The right kidney is partially visualized and in the central portion there is a linear area of increased density. The findings from this examination show an apparent absence of bladder. The general appearance of the right kidney is suggestive of some pathology. It appears to be much smaller than the left." Uroselectan revealed the left kidney pelvis, with its calices, and the ureter which emptied directly into the urethra. On the right side the dye did not show the pelvis but the urter was seen to go down to just below the transverse process of the fourth lumbar vertebra where it appeared to cross over to the left. (Fig. 5.)

From the history and findings on examination I believe this to be a case of congenital absence of the bladder with malformation of the right kidney and ureter.

**CASE 6.**—Hospital No. 46,000. F. B. C. M. Lt. (jg) United States Navy, age 27. Admitted December 29, 1931.

*Chief complaint.*—Intermittent cramping pains in the suprapubic region.

*Family history.*—Negative.

*Past history.*—Measles, mumps, chicken pox, (and diphtheria in childhood with no complications. Influenza, 1919; tonsillectomy, August 1931.

*Present illness.*—Has had intermittent pain in the suprapubic region, cramping in character, for 2½ years. It is usually present in the morning on arising and lasts for about 1 hour. For the past 8 months it has become more severe and more frequent in occurrence. When in a stooped position the pain is relieved somewhat. At times there is a slight burning on urination but this does not appear to have any relation to the pain in the suprapubic region. There is no history of urgency, nocturia, or hematuria. The ship's medical officer reported the urine to show a trace of albumin and occult blood. Physical examination revealed a palpable mass in the abdomen about 2 inches in breadth running transversely just below the umbilicus and felt only in the midline; prostate slightly enlarged and tender but not indurated, otherwise negative.

Urological examination revealed a shadow 2.0 centimeters in diameter in the region of the left kidney pelvis which was partially obscured by pyelographic medium; a deformed pelvis on both sides with the lower calices nearer the vertebrae than the upper and the ureters opening high up into the pelves. See illustration no. 1. Cultures of catheterized specimens from both kidneys were positive for colon bacillus. Kidney function as determined by P.S.P. was normal for both kidneys. The bladder appeared normal. There was a mild degree of urethritis, posterior. A diagnosis of bilateral pyelitis and calculus on the left side of a horseshoe kidney, was made.

Pyelolithotomy with a plastic operation on the left kidney pelvis was done, after clearing up the pyelitis with pelvic lavage and drainage. Recovery was uneventful.

Cultures taken June 28, 1932, were negative. He has been symptom free and urine has remained negative up to the present time.

CASE 7. Hospital no 49,778. W. S. (V. B. P.) Age 37, Negro. Admitted February 4, 1933.

*Chief complaint.*—Dizziness and a sharp pain that shoots down into the back.

*Family history.*—Negative.

*Past history.*—Measles and mumps in childhood with no complications. Operated on for some kidney trouble in 1917.

*Present illness.*—While in the Army in 1917 he was operated on for some kidney trouble. He did not know what the trouble was but stated a post operative sinus drained for about 1 year. One month after going home in the fall of 1917 he began to pass blood in his urine which lasted 2 or 3 days and occurred once a month. The blood appeared at the end of urination. He had a good urinary stream with no dysuria, frequency, nocturia, or dribbling. About the same time that he noticed blood in his urine he began to have attacks of dizziness which were so severe that if he did not hold on to something he would fall. A few minutes later he would have a sharp pain which ran from the left nipple to the left kidney region. The dizziness lasted 3 or 4 minutes and was followed by a severe headache which lasted 2 or 3 days. The pain was a single sharp shooting one, which left no soreness. These attacks have occurred at irregular intervals up to the present time and usually appear when his bowels have not moved for 2 or 3 days. He always has a dull pain in the left kidney region when lying on the left side. At times there is a urethral discharge.

Physical examination revealed a linear scar (depressed) in the left kidney region, palpable bilateral epitrochlear glands, a tubular tender mass in the region of the descending colon, and a purulent urethral discharge. Blood Kahn was negative. Blood count: W.B.C. 5,850; bands 6 percent; segmented 60 percent; lymphocytes 30 percent; eosinophiles 1 percent; monocytes 3 percent.

**Urological examination.**—No residual urine in the bladder. Bladder capacity 300 cubic centimeters. The bladder orifice was inflamed and edematous all the way around. The trigone was very large extending high up into the bladder making the floor oval in shape with deep clefts on both sides which ran into a depression above it. The mucous membrane was normal in appearance everywhere except over the bladder orifice. Both ureteral orifices were large and clear urine was seen to come from them in rhythmic spurts. Cystoscope drawn into the posterior urethra showed a large hole between the vera and the bladder orifice which appeared to extend under the bladder wall on the left side. When drained, foul smelling urine came from it. The entire posterior urethra was chronically inflamed. A catheter was passed up both normal ureters and also in the hole in the urethra. Cultures taken from each of them were negative for the normal ureters and positive for colon bacillus from the urethral ureter. P. S. P. injected intravenously appeared in 4 minutes from the right,  $4\frac{1}{2}$  minutes from the left normal ureter, and in 11 minutes from the urethral ureter. Sodium iodide injected into each of them showed a normal ureter and kidney pelvis in the right side, a normal ureter with orifice in bladder, and pelvis on the left side, but with only two groups of calices corresponding to the lower and middle groups; while that injected through the opening in the urethra showed a greatly dilated tubular structure which extended up to the level of the left kidney. At the upper terminus of this structure there appeared to be a dilated calyx. See illustration no. 2. Skiodan given intravenously revealed an apparently normal functioning kidney on the right and left sides. The accessory ureter was not seen.

It was impossible to determine if the accessory ureter came from the upper portion of a double kidney or an accessory kidney, because the patient refused operation.

#### SUMMARY

Cases 1, 2, and 3 are of little interest other than being malformations. Case 4 is of interest because of the difficulty in arriving at a diagnosis and shows the difficulties that may be encountered by not removing a pus ureter with a pyonephrotic kidney. Case 5 was an unusual malformation which was not discovered until the age of 32 even though he had served 2 years in the Army. Case 6 shows the results which may be obtained on a horseshoe kidney with a plastic operation. Case 7 unfortunately could not be completely studied because the patient refused operation. In case 8 a diagnosis of polycystic kidney was made more from the history than the findings. Cases 9 and 10 are of so much interest from a diagnostic point of view, they will be made the subject of a separate report.

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#### EIGHT YEARS OF THE KAHN TEST

By F. M. ROHOW, Lieutenant, Medical Corps, United States Navy

On this, the eighth anniversary of the use of the Kahn test in the United States Navy, it is appropriate to chronicle the value and the remarkable success which this test has achieved in the detection of syphilis.

In 1921 Kahn began his studies on the phenomenon of precipitation with syphilitic sera. After a period of investigation by Kahn and his coworkers, this test became the official test in December 1925 of the United States Navy for the detection of syphilis. Since its adoption it has rendered such uniform results comparing it with several complement fixation and flocculation methods, that for our purposes it is comparable, if not superior, to all other methods.

The simplicity of technique; the use of only three reagents as compared to six in the complement fixation methods; the elimination of animals especially on ships and small stations is a distinct advantage over other methods. The element of time involved (less than 1 hour in case of the Kahn) makes this test of particular value in emergency work.

The three Kahn procedures on serum, viz; the qualitative, or regular three-tube test, the quantitative test, and the presumptive test. offer something more than merely a diagnostic aid.

The quantitative test, in cases of strongly positive serum and in cases treated by various methods, offers a method for study on the basis of potency not attained by other procedures.

A highly sensitized antigen may be used as presumptive evidence which, when positive in the presence of a negative qualitative test, may furnish a clue leading to the establishment of syphilitic infection. In addition to furnishing this clue it acts as a technical check on weakly positive and negative tests in the regular Kahn procedure.

The spinal fluid procedures are equally reliable and a high degree of uniformity exists in the examination by the qualitative, quantitative, and presumptive methods.

The micro methods using small amounts of serum, chancre fluid, and spinal fluid make the Kahn test particularly valuable, especially in younger persons where sufficient serum cannot be obtained for other procedures. These are considered emergency methods and should not replace the regular procedures. Nevertheless, a high degree of accuracy may be attained by these methods.

The manufacture and standardization of the antigen used in this test is carried on at a central institution, the United States Naval Medical School, and in addition a final check is made at the laboratories of the University of Michigan before it is issued.

This standardization insures uniformity which is so essential for the proper results in any test in which antigen is a reagent, and is the only test for syphilis in which a standard antigen and standard equipment is used.

Up to the present time a total of 125,920 cubic centimeters of antigen, an equivalent of approximately 2 million tests, have been

made and shipped to 20 hospitals, 30 shore stations (other than hospitals) within the borders of the United States, 16 foreign shore stations, and 110 ships scattered in various parts of the world.

#### GUNSHOT WOUNDS IN NICARAGUA

By H. V. HUGHENS, Lieutenant Commander, Medical Corps, United States Navy

It is generally thought that inhabitants of tropical countries have a relatively low resistance to shock and acute pulmonary involvement. The blood count of such people, even natives of cooler climates who live for any considerable time in the tropics, shows a decrease in the white blood cells to an average of 5,500 with a low neutrophile count. This was noted by the writer during 1919-22 in the Virgin Islands. Other observers have found the same type of blood counts in tropical inhabitants.

The living conditions and dietary of the Nicaraguans are not the kind that ordinarily would be considered conducive to strong physical endurance. The existence of a marked resistance of the natives to the strains of microorganisms in Nicaragua is emphasized by the fact that members of the Guardia Nacional de Nicaragua receiving severe wounds appear to make a surprising rapid recovery.

During 1932 the number of men wounded in the Guardia was larger than during any like period of our affiliation with the organization. Seventy-five major operations were performed in the Guardia General Hospital at Managua. Most of these operations were performed incident to gunshot or bomb wounds. There were many injuries which did not require major operative procedures. There were only two gunshot wound cases who died after being received at the hospital and they were both moribund upon arrival.

A few of the cases are cited for the purpose of verifying observations of the resistance of Nicaraguan troops to wounds and infection.

CASE 1.—Private, age 25 years. Wound, gunshot, abdomen. This man was shot with a .38 caliber pistol. The bullet struck the left femur in upper third ranging upward entering abdomen. X-ray showed bullet midway between symphysis pubis and umbilicus. The man had been wounded 13½ hours previous to his admission to the hospital. Under spinal anaesthesia a midline abdominal incision was made. The projectile was found superficially within the peritoneal cavity. The cavity was filled with blood, feces, and ascaris lumbricoides. At one large perforation a large ascaris was found shot in two. The abdominal cavity was cleansed as well as possible. Suturing of the perforations with silk was begun and 10 large per-

forations of the ilium were closed. It was necessary to give adrenalin, glucose, and saline intravenously during the operation to maintain life. The patient's condition seemed hopeless. Usual post operative shock treatment was given. Thirteen days following the operation the patient developed a left parotitis with a temperature of 102. White blood count 12,200 and 84 percent polymorphonuclears. The blood count 4 days previous was 5,600 with 72 percent polymorphonuclears. Seven days following the appearance of the parotitis, it had subsided. (Probably mumps.) Kahn blood 4 plus. The patient had gonorrhea and developed benign tertian malaria. In addition to his 10 intestinal perforations, this patient had ascariasis, parotitis, syphilis, gonorrhea, and malaria. He was discharged to duty, after 93 days, well except for a small ventral hernia. A few months later he returned and the ventral hernia was repaired.

CASE 2.—Private, age 26 years, received 27 hours after suffering a gunshot wound of abdomen. Considerable blood and feces were free in abdomen. Hemorrhage was checked and five perforations of ilium found and sutured. This patient made an uneventful recovery and was discharged to duty well after 34 days.

CASE 3.—Private, age 20 years, was shot through right supraclavicular space perforating the pleura and ranging downward to right of spinal column. X-ray showed second to sixth ribs inclusive fractured near the vertebral attachment. A projectile was shown at upper border of seventh rib and near its vertebral attachment and a similar one about 3 inches further away on the upper border of same rib. This patient had been carried by mule and stretcher for 4 hours to landing field where he was picked up by plane and brought to hospital approximately 24 hours after receiving his injury. He developed pneumonia 7 days after admission. When patient's condition would permit, an incision was made over the sites of the projectiles and they were removed. The one nearest the spine was a steel jacket and the other was the lead of a Krag bullet. Drainage was instituted. Twenty-six days after admission a definite empyema was diagnosed. The seventh rib was resected under procaine anesthesia for 2 inches at post axillary line. Considerable pus was drained. A counter opening was made and rubber tube drainage inserted. The patient later developed benign tertian malaria and active amoebic dysentery. One hundred and thirty-eight days after admission the patient was discharged to duty with fairly good expansion of the injured lung. He remained well and on duty for the next 7 months. No further observation was possible for our forces left the country at this time.

CASE 4.—Private (HC), age 23 years, received by plane at the Guardia General Hospital 24 hours after receiving the following machete wounds. Wound, incised, right hand almost amputating

thumb; wound, incised, left olecranon with injury to elbow joint; wound, incised, about 2 inches below elbow severing the ulna nerve and fracturing the ulna. Wound, incised with injury to shoulder joint and surgical neck of humerus. Wounds, incised, neck including ligamentum nucha and trapezius down to cervical vertebra. Left sterno mastoid partially severed. Scalp and forehead lacerated in several places. Wounds and nerve were sutured under ether anesthesia, requiring 2 hour's time. This patient made an uneventful recovery and was discharged to duty in less than 5 months.

Three men were shot through chest involving the lung. Each spat up blood for a few days and in each case was discharged from the hospital within 30 days. None had any complications.

There has been no attempt made to describe the complete treatment and procedure in these cases. The hospital facilities were fairly adequate but not ideal.

#### SUMMARY

Four of the most desperately wounded cases occurring in the Guardia Nacional de Nicaragua are described, and three men who received chest wounds are mentioned as indicating the apparent high resistance to trauma and wound infection.

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#### EXTERMINATION OF BEDBUGS ON BOARD SHIP

By R. E. BAKER, Lieutenant, Medical Corps, United States Navy

My object is to invite attention to a method for the eradication of the *cimex lectularius* which, while not new, seems not to be very widely known or appreciated in the naval service at large. The subject of bedbug extermination, while only a minor item in life aboard ship, seems important enough as a source of persistent irritation as to deserve more than passing attention and it is believed that if knowledge of the method herein described becomes more widespread and is applied, that suppression of this nocturnal pest will become a simple and easy task.

It has been my experience that the usual methods of eradication employed aboard ship are not efficacious. Burning bed springs off with a blow torch or spraying with any of the various liquid sprays, while probably effective if a direct hit is made, do not solve the problem. Cyanide or sulphur fumigation is sometimes impractical because of lack of proper facilities and trained personnel.

Stitt (1) advocates this method. He states that a temperature of 113° F. will kill bedbugs within a few minutes and will also kill the

eggs. It is a simple method, requires little expense, and no apparatus except a few electric heaters which are available at any navy yard. The only requirement is that the space to be treated must be a closed compartment.

On the U.S.S. *Arctic*, we had one compartment in which bedbugs persisted in spite of thorough and repeated treatment with blow torch and sprays, renovation of mattresses, etc. On a trip to the Mare Island Navy Yard we closed up the compartment and turned on three electric heaters (borrowed from the yard) and easily raised the temperature of the compartment to 115° F. and kept the temperature at this height for a period of 3 hours. Clothing and bedclothing were left in the compartment undisturbed. A thermometer was hung over a closed porthole, facing outward toward the passageway, so that the inside temperature could be determined without entering the compartment.

The result was that this compartment, which had been badly infested in spite of the usual measures, has been entirely free from bedbugs since that time—a period of several months.

A trial of the dry heat method is strongly urged for those who find this insect present aboard ship.

#### REFERENCE

- E. R. Stitt. *Diagnostics and Treatment of Tropical Diseases (Fifth Edition)*, page 890.



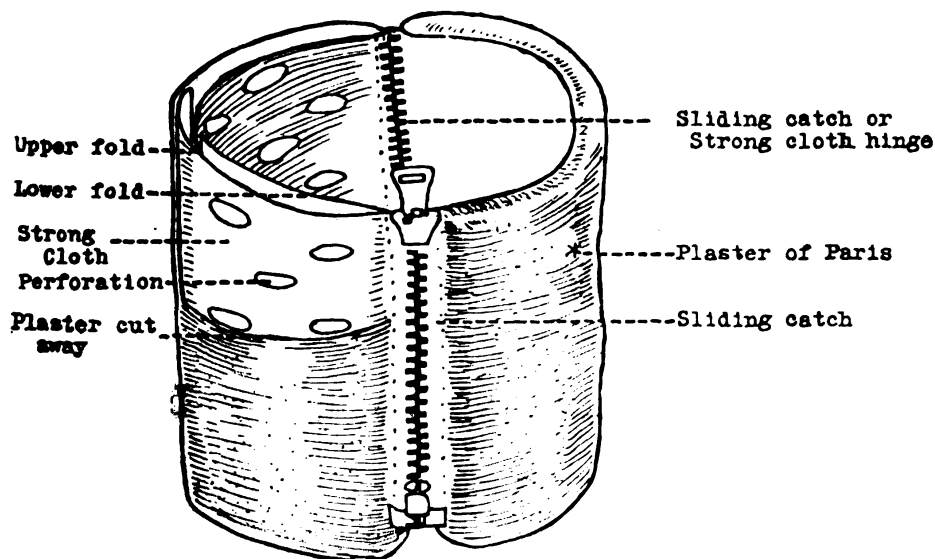
## SUGGESTED DEVICES

### A NEW BIVALVE PLASTER CAST

HOWARD L. PUCKETT, Lieutenant (Junior Grade), Medical Corps, United States Navy

To bivalve a plaster-of-paris cast is often a time-consuming and awkward procedure, in spite of the various expensive instruments devised to cut plaster. These difficulties were obviated by using the following method in making the cast:

Two sliding fasteners of the desired length were obtained, and a strong cloth of 8 inches wide was folded in half and sewed at the fold to the margin of the fasteners on either side. The cloth was per-



Sketch of zipper bivalve plaster cast.

forated uniformly throughout by clipping holes in it about 1 centimeter in diameter. The four cloth wings of each fastener were then infiltrated with anhydrous plaster-of-paris and applied over the padding of the affected part so that the fasteners were opposite each other on the lateral and medial sides. The apparatus was held in place with rubber bands as wet plaster-of-paris gauze was applied longitudinally over the lower folds of the perforated cloth, which was previously sprinkled with water. The gauze was continued in layers on the one half until a suitable thickness was obtained. The

upper folds of cloth, which covered the sliding fasteners and protected them from the wet plaster-of-paris, were finally applied as the last layer. A heavy coating of the anhydrous gypsum was dusted over this and sprinkled with water. The same procedure was repeated for the other half of the cast.

The final result was a strong bivalved cast that could be quickly removed for physiotherapy without any discomfort to the patient. The sliding fastener can be used wherever a plaster-of-paris cast is indicated. The fasteners can be saved, when the services of the cast are no longer required, by cutting the folded cloth from its margins.

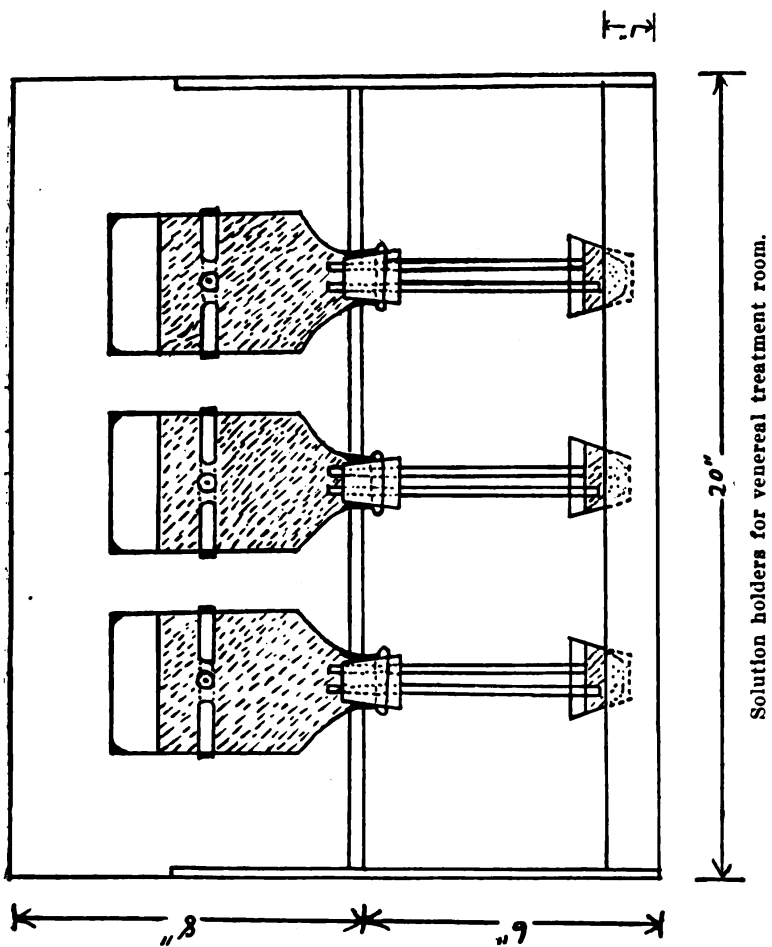
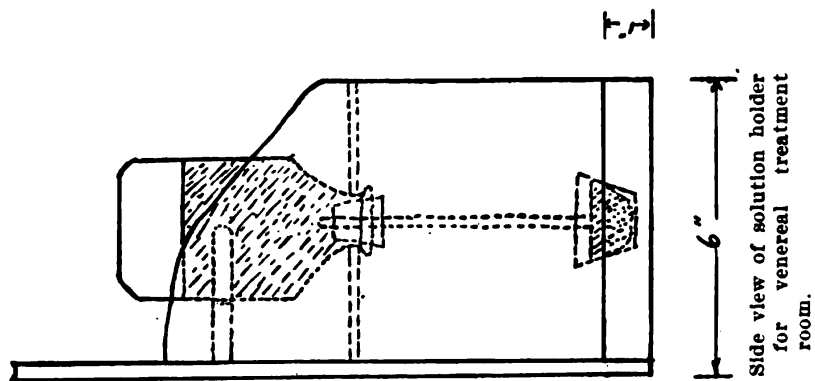
#### **A NEW SILVER PROTEIN DISPENSING APPARATUS**

By C. B. CAMERER, Commander, Medical Corps; and E. E. PRESTRIDGE, Pharmacist's Mate (3d Class); United States Navy

There is submitted herewith a brief (description and cuts of a new device for the convenient and economical dispensing of the various silver protein solutions) in constant use for venereal prophylaxis administration and treatment for G.C. infections. The set-up consists of three 500 cubic centimeters standard alcohol bottles fitted in a convenient wooden or sheet metal rack (see cuts nos. 1 and 11 for front and side elevation), and held firmly in place by brass clips. The stoppers, preferably of rubber, are fitted for two lengths of glass tubing of suitable length to reach half-way down the interior of the standard medicine glasses, used as "cups", as shown in the cuts, the shorter one being readily adjusted as required. The mechanical principal is obvious, and the outfit requires no further attention than periodic refilling of the containers. The solutions are withdrawn from the cups by a penis syringe and the cups automatically refill.

It has been found convenient and practicable to label the containers from left to right " $\frac{1}{4}$  percent protargol", "5 percent silvol", and "1 percent protargol", they being used in this order for consecutive weeks in the treatment of gonorrheal infections. The 5 percent silvol is regularly employed as the injection solution for venereal prophylaxis. Penis syringes as required for use are kept in a separate container, immersed in a 1:1000 solution of bichloride of mercury, the personnel being instructed in their use by the hospital corpsmen detailed to this service.

This apparatus, readily constructed on board ship by the ship's force, has been found to be very practical and economical and at the same time very easily kept clean, no splashing or spilling of silver solutions being encountered with the customary untidy and disagreeable appearance so often observed when working with these solutions.

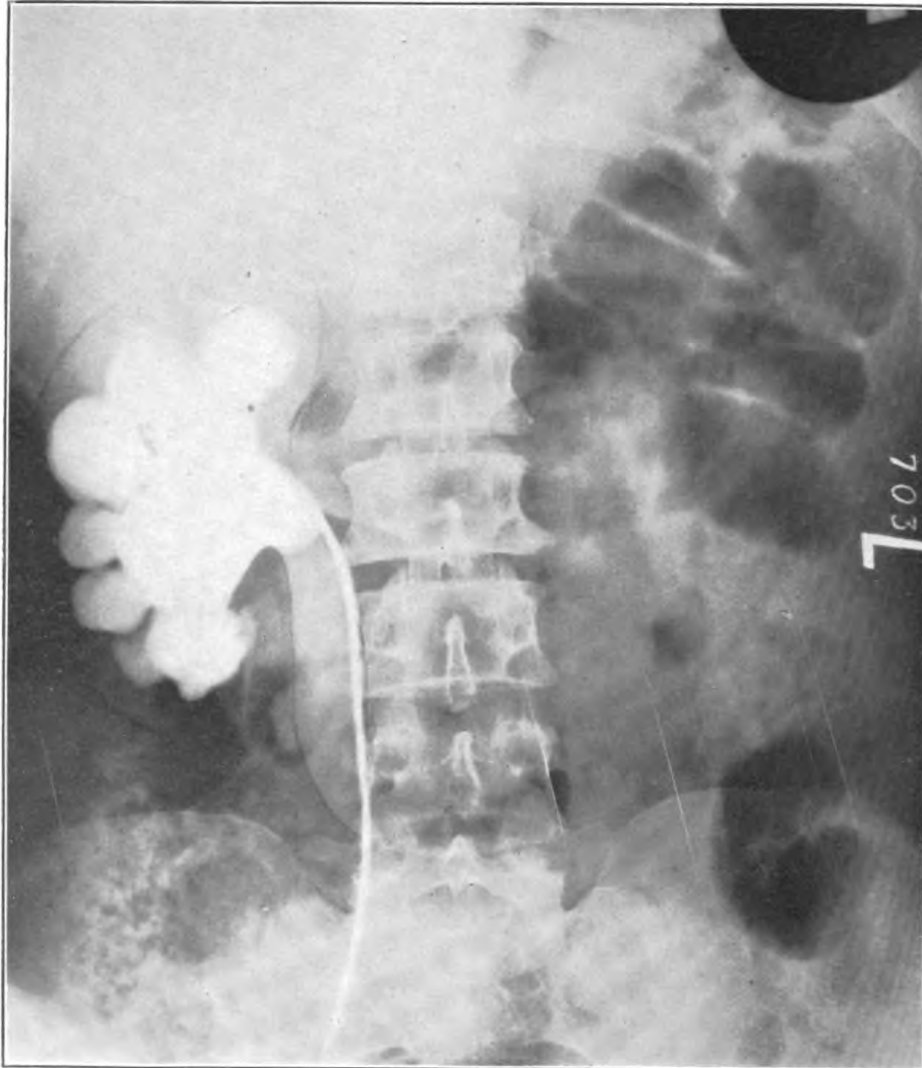






198-1

POLYCYSTIC KIDNEY AND HYDRONEPHROSIS.



POLYCYSTIC KIDNEY AND HYDRONEPHROSIS.

198-2

## CLINICAL NOTES

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### POLYCYSTIC KIDNEY WITH HYDRONEPHROSIS

#### • A report of 2 cases

By W. H. WHITMORE, Lieutenant Commander ; and M. S. MATHIS, Lieutenant Commander ;  
Medical Corps, United States Navy

In pyelograms of hydronephrosis, the only change noted in early cases is blunting and dilatation of the minor calyces. With continued obstruction the pelvis and major calyces are dilated, and in advanced hydronephrosis, the calyces are lost in the grossly dilated pelvis. This dilatation of the pelvis results in a thinning of the renal cortex, so that the advanced hydronephrotic kidney is a thin-walled sac, consisting of the dilated pelvis in which the calyces are merged, partly covered by a thin layer of renal cortex.

Although there are infinite variations in the minor details of pyelograms, gross changes should lead to a consideration of the mechanical factors concerned, which may assist in determining the diagnosis. In the two cases reported, the pyelograms differed radically from the usual hydronephrotic type, suggesting factors other than simple obstruction ; and further studies resulted in the diagnosis of hydronephrotic polycystic kidneys.

As all authorities agree that operations on polycystic kidneys should be avoided if possible, it is of utmost importance to recognize this condition, with calculi, hydronephrosis, or other associated pathology. For this reason, the two cases are reported as diagnostic studies.

CASE 1.—E. L., V.B.P., 50255, white, age 44 ; admitted March 14, 1933, for treatment of lumbar myalgia. Chief complaint, pain in right lumbar region and over right eye. Family history and past history not significant.

*Present illness.*—Since influenza in 1918, patient has been having attacks of sharp, severe pain in the right lumbar region ; the pain is localized and does not radiate. The attacks are of gradual onset, at intervals of 2 to 10 days, of equal severity, and gradually wear away leaving an area of soreness in the right flank. He has had nocturia, once nightly, for the past 6 months ; occasionally there is slight burning on urination. Whenever he contracts a head cold there is an aching pain over the right eye.

X-ray examination of the genito-urinary tract showed a dense triangular shadow near the lower pole of the right kidney, which appeared to be outside of the kidney, and not in the line of the ureter. Pyelographic study demon-

strated that this shadow was either in an elongated inferior calyx or in a cyst communicating with the calyx. The pelvis was mainly intrarenal and grossly dilated, but the calyces were distinct with relatively narrow infundibulae. Outside of the dilated calyces the shadow of the renal cortex was much thicker than would be expected with the marked hydronephrosis. The upper half of the ureter was dilated. (See illustration no. 1.) The narrow infundibulae with the marked hydronephrosis and relatively thick cortex could be explained best by the presence of multiple cysts in the kidney cortex, so a diagnosis of polycystic kidney was suggested. Pyelogram of the left kidney revealed the characteristic changes of polycystic kidney.

CASE 2.—J. L., F2c, United States Navy, white, age 21; admitted May 31, 1933 for treatment of hydronephrosis. Family history and past history not significant.

*Present illness.*—Two months prior to admission, while in Panama, patient was taken suddenly with a sharp, severe pain in the left kidney region, and inability to urinate, which lasted 18 hours. The pain suddenly stopped, and he passed large quantities of bloody urine. The hematuria continued for 4 days. After cystoscopic examination in another hospital, a diagnosis of hydronephrosis was made, and the patient was transferred to this hospital for treatment. Physical examination, on admission was essentially negative, except for genito-urinary findings. P.S.P. elimination 15 minutes after intravenous injection, right kidney, 6 percent; left kidney 2 percent; appearance time, right kidney, 3½ minutes; left kidney, 6½ minutes. Cultures from both kidneys were negative.

A left pyelogram showed the pelvis mainly intrarenal and grossly dilated. The superior calyx was dilated, with a moderately wide infundibulum separated from the middle calyx by a deep cleft. The middle and lower calyces were partly obliterated; the cortex, beyond the calyces was relatively thick. (see illustration No. 2.) The appearance suggested hydronephrosis with persistent fetal lobulation or polycystic kidney.

Pyelogram of the right kidney shows a very long kidney, with the calyces widely separated and somewhat elongated; and the cortex outside of the calyces very thick. The abnormal pyelogram, with the thick kidney cortex, suggested the diagnosis of polycystic kidneys, which was consistent with the history of the clinical findings.

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#### THE MARCUS GUNN SYNDROME; REPORT OF A CASE

By G. C. WILSON, Lieutenant Commander, Medical Corps, United States Navy

This unusual and interesting condition, sometimes called jaw-winking, was first described by the British surgeon Marcus Gunn in 1883. Something over 100 cases have been reported. The condition consists of an abnormal relation between the nerve supply of the levator palpebrae superioris and the motor portion of the trigeminus, some authorities believing this anomalous connection to be central while others argue for a peripheral connection. While most cases are unilateral, congenital, and accompanied by ptosis, the condition may be bilateral, acquired or without ptosis. There is usually a paralysis of some extrinsic muscle of the eye, the superior rectus being most often involved.





A. Complete ptosis of the left upper lid when both eyes are open in the primary position. Note absence of wrinkling. B. Left eye opens when right is occluded. C. Left eye opens with mouth. The camera was snapped too soon here as the eye actually opened to an approximately normal extent. D. Lagging of left eye when carried into field of left superior rectus. E. Both eyes partially open and to an equal extent when looking down.



The usual clinical picture consists of a unilateral ptosis, squint, which is most commonly vertical, and jaw-winking, the eye with the ptotic lid opening and closing with the mouth.

The following report of a case recently seen by the author is submitted:

Boy, age 9. Mother states patient's left eye has been closed since birth but that it opens when his mouth is opened, the condition being especially noticeable while eating. Family and personal history otherwise negative.

Examination reveals a physically and mentally normal child except for the eye condition to be described presently.

VOD 20/20, VOS 20/40 corrected to 20/20 with plus 1.50 sph. Fundi negative.

In the primary position and upper fields the left eye is closed due to a complete ptosis of the lid. There is no wrinkling nor other evidence of contraction of the orbicularis oculi as would be expected if this were a voluntary closure. The lid hangs down smoothly over and completely occludes the eye. If the right eye is covered in the primary position the left eye opens to a degree approximating the normal. Both eyes open in all positions when the mouth is opened. The left superior rectus is paretic giving rise to a vertical diplopia in the primary position and upper fields when both eyes are open in these positions.

There is binocular single vision with third degree fusion in the lower fields where both eyes partially open to an equal extent independently of the mouth.

Closure of one eye in the fields of diplopia with equal opening of both eyes in the fields of binocular single vision naturally brings up the question of this being a voluntary closure due to the desire for binocular single vision. However, the absence of any evidence of contraction of the orbicularis, as previously mentioned, would seem to rule this out.

In conclusion the author wishes to thank Dr. Rudolph Abeli, of New York City, for his valuable suggestions in the preparation of this paper and for his kind permission to reproduce the original photographs of this case which were taken by him.

#### BIBLIOGRAPHY

- Fuch's Textbook of Ophthalmology, 5th. Ed. p. 691.  
Peter's Extra-Ocular Muscles, p. 266.  
Diseases of the Eye, DeSchweinitz, 10th. Ed. p. 195.  
Goar, E. L., American Journal of Ophthalmology, June 1927, p. 431.  
Marin, Amat M. Arch. de Oft. Hisp.-Amer. Oct. 1930, V. 30, p. 530. (Abstract of Marin's article in the Archives of Ophthalmology, June 1931, p. 971).  
Index Medicus, 1884, p. 147.

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#### COCCIDIOIDAL GRANULOMA WITH LESIONS IN THE SMALL INTESTINE

By FREDERICK C. GREAVES, Lieutenant, Medical Corps, United States Navy

The following case report is that of Coccidioidal granuloma in which the fungus was demonstrated in lesions found in the small intestine.

A Negro man of 38 was admitted as a Veterans' Administration patient to the Mare Island Hospital on January 30, 1933. He complained of multiple skin lesions, dyspnoea, and backache. He first noticed some nodular swellings in his scalp 6 weeks before admission, while convalescing from an attack of influenza. A few days later dyspnoea appeared, associated with a cough and the raising of small quantities of blood. At this time he entered a hospital in the community in which he lived.

His past history revealed that he had an appendectomy in 1925 and that a right inguinal hernia had been present for several years. He was married and had five children all of whom were in excellent health. His wife was well and there was no history of miscarriages. He had lived in the San Joaquin Valley for the past 7 years and had been employed most of that time as a day laborer in a small saw mill. To the best of his knowledge, no cases similar to his had occurred within the circle of his acquaintances.

Examination revealed an emaciated Negro man who was obviously very sick. He was dyspnoeic and complained of a deep-seated pain in the back.

Subcutaneous nodules were present in the scalp, on the neck, back, chest, and the extremities. These varied in size from a pea to a hazel nut. They were tender to the touch and some had broken down forming ulcers with irregular borders and grayish bases.

Normal percussion notes were present throughout both lungs but coarse moist râles could be heard in both lower lobes. The abdomen was moderately distended with fluid. There was some rigidity of the abdominal muscles and considerable tenderness in both lower quadrants. A tender mass the size of a hen's egg was present in the right inguinal canal. Tenderness could be elicited by light pressure upon the spinous processes of the dorsal and lumbar vertebrae.

Red blood cells were 2,800,000 with 39 percent hemoglobin. The white blood count was 18,700 of which 87 percent were mature neutrophils, 8 percent lymphocytes, 3 percent band forms, and 2 percent young forms. The urine was negative. Smears and cultures made from the subcutaneous ulcers were positive for *Oldium coccidioides*. The blood sedimentation index was 36. The X-ray examination of the chest showed evidence of acute inflammatory changes in the right central and upper lobes and lymphatic infiltration of the right hilus. No abnormalities were noted in the vertebral column. The sputum was negative for tubercle bacilli and *Oldium coccidioides*.

The temperature varied from 98 to 104, and the pulse from 72 to 100, while the respirations ranged between 18 and 28. At no time did he have any symptoms referable to the intestinal tract. His course was downward and he died on February 5, 1933.

An autopsy was performed 20 hours after death. There were multiple-crusted ulcers over the forehead, neck, back, arms, and legs, and numerous, subcutaneous nodules in the same regions. All the nodules contained a thick, creamy pus. Many small abscesses were present in the subcutaneous tissues overlying the sternum and ribs. The parietal peritoneum was greatly thickened and adherent to the visceral peritoneum by recently formed, gelatinous adhesions. The entire peritoneum was thickly studded with military nodules which grossly resembled military tubercles. Similar nodules were present in large numbers in the heart muscle, spleen, kidneys, and liver. The lungs showed a bronchopneumonic process in both lower lobes. The lymph glands about the hilum and in the mediastinum were all enlarged and many contained pus.

Two intestinal ulcers were found. One measuring  $\frac{3}{4}$  by  $\frac{1}{4}$  centimeter was present in the lower jejunum and the other measuring  $\frac{1}{2}$  centimeter in diameter was present in the mid ileum. They were similar in appearance. The margins of the ulcers were yellowish in color, were raised above the surface of the surrounding mucosa and formed a halo about the craters. They gave the impression of an ulceration that had occurred in raised plaque.

The mass in the inguinal canal was found to be a greatly thickened hernial sac which resembled the thickened peritoneum and like it contained many miliary nodules.

Numerous small abscesses were present beneath the periosteum of the ribs and of the vertebrae. Cultures made from this pus, as well as from the pus obtained from abscesses in the subcutaneous tissues and the lymph glands, all produced luxuriant growths of staphylococcus albus in pure culture in 12 hours. After 3 days a white mold appeared on the slants and eventually overcame the growths of staphylococci.

Microscopic studies of the lesions in the various organs and tissues all showed a large number of the doubly contoured highly refractile *Oldium coccidioides* in all stages of development. In some, the cysts were filled with dozens of distinct endospores while in others less mature, the centers were granular and less distinct. The tissues about the fungi were infiltrated with leucocytes, lymphocytes, and plasma cells. Giant cells were found in a few areas. Sections made of the intestinal lesions showed the same general picture as did the other affected tissues, with the exception that giant cells were present in considerably greater numbers than elsewhere. The refractile bodies were numerous, especially in the bases of the ulcer, which apparently did not extend beyond the submucosa.

#### COMMENTS

The first case of Coccidioidal granuloma to appear in the literature was reported by Wernicke in 1892 (1). Since that time frequent cases have been reported from South America, Italy, and 12 widely separated States in this country. In the United States the largest group has been reported from California. The California State Board of Health issued a special bulletin in 1931 listing 254 cases.

The causative factor was first thought to be a protozoan and its close resemblance to *Coccidia* caused Stiles to name it *Coccidioides immitis*. In 1905 Ophuls (2) proved that it was a fungus and that the coccidia-like form that it assumes in the tissues was only one phase of its life cycle and that on artificial media it grew as an ordinary mold with mycelia and aerial hyphae.

In its early manifestations it closely resembles tuberculosis. Most of the cases to be reported have been fatal cases and usually the final picture has been one of a widespread generalized infection. Lesions have been described in the central nervous system, skin and subcutaneous tissues, bones and joints, heart, lungs, and the abdominal viscera, with the exception of the intestinal tract. The absence of intestinal lesions was commented upon by Ophuls in 1929 (3).

## SUMMARY

There is reported here apparently the first case in which *Oidium coccidioides* were demonstrated in the intestinal lesions in a case of generalized Coccidioidal granuloma.

## REFERENCES

- (1) Wernicke, R.: *Über einen Protozoandefund bei Mycosis fungoides*, Centralbl. f. Bakteriologie. 12: 859-861 (Dec.) 1892.
- (2) Ophuls, W.: *Further Observations on a Pathogenic Mold Formerly Listed as a Protozoan*. J. Exper. Med. 6: 443, 1905.
- (3) Ophuls, W.: *Abstract of Discussion on papers of Cummins, Smith and Halliday, and Pulford and Larson*. J.A.M.A. 93: 1055 (Oct. 5) 1929.

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HEMATOMA AURIS

By LEON D. CARSON, Lieutenant, Medical Corps; and JAMES L. BROWN, Commander, Dental Corps; United States Navy

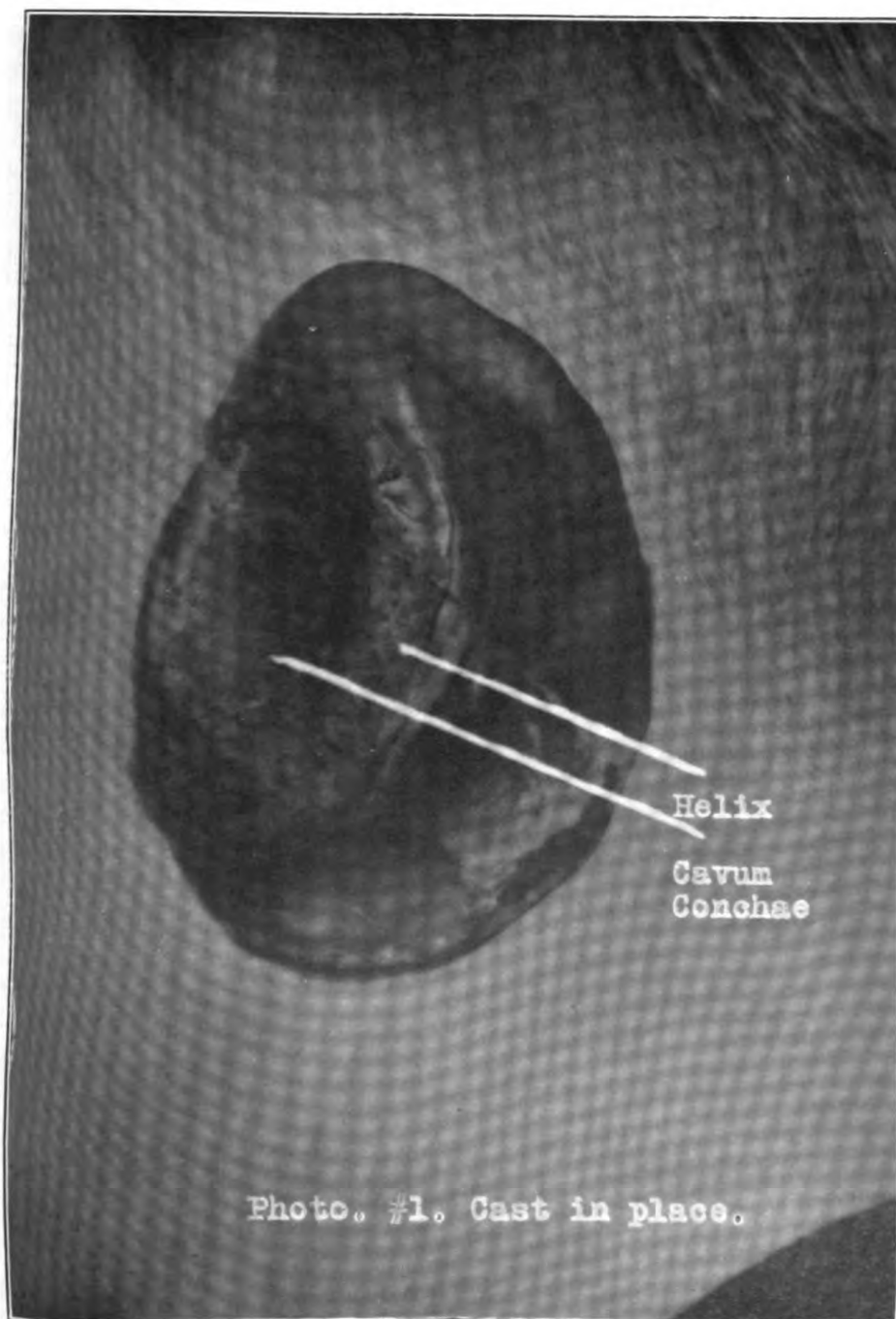
The patient, Carter, C. K., Private, United States Marine Corps, reported to the Sick Bay, United States Naval Air Station, San Diego, Calif., on September 22, 1933, with a well developed hematoma of the left ear, completely filling the cavum conchae, and limited in extent by the firm skin attachment over the antihelix and tragus. The patient stated that this had resulted from an injury to this ear, incurred in a wrestling match 6 days prior to admission.

Examination showed a firm, fluctuant swelling completely filling the cavum conchae; the skin over this swelling appearing a purplish color.

Having had rather unsatisfactory results in previous cases of this sort using ordinary means of maintaining pressure upon the detached skin, after aspirating the hematoma, consultation was obtained with the senior dental officer, as to the possibility of modeling an accurately fitting cast, completely enclosing the ear and exerting firm pressure both anteriorly and posteriorly with the idea of preventing further sero-sanguinous exudate under the detached skin and soft tissues. This was considered entirely feasible.

Under proper asepsis, the hematoma was aspirated with the recovery of 2 cc of bloody serum. The patient was removed to the dental office, where a dental composition (modeling compound) cast was applied, completely enclosing the ear, posteriorly and anteriorly, and maintaining moderate pressure upon the area of skin detached from the perichondrium. Illustration shows the cast in place.

On the third day following, the cast was split, the ear inspected,  $\frac{1}{2}$  cc of recurring serum again aspirated, and the cast then reapplied and sealed together using a heated spatula along the line of division.



CAST APPLIED AFTER ASPIRATION OF HEMATOMA OF EAR.





Two days after this, the cast was removed. The skin and subcutaneous tissues were apparently attached to the perichondrium. The ear was inspected daily for the 4 succeeding days, after which it was apparent that firm attachment of the skin to the perichondrium had resulted. The total duration of treatment with the cast was 5 days. The ear was perfectly normal in appearance.

Hematoma auris (pugilist's ear, wrestler's ear), is described in Da Costa's Modern Surgery, Ninth Edition, as—

a collection of blood between the perichondrium and the auricle. The blood is absorbed very slowly, and as a result of fibrous degeneration and softening of the cartilage the auricle becomes twisted and shrunken.

The *old* cauliflower ear is the end result of replacement of the hematoma and serum by fibrosis, along with a necrosis or destruction of the cartilage. In cases of repeated injuries of this character, we sometimes see lumpy, fibrotic, shriveled ears which have lost all resemblance to the original.

The usual method of treatment is aspiration, or incision, preferably done within the first 5 days of the accident, followed by pressure by means of modeling compound, nonflexible collodion and cotton, felt, plaster of paris, or other mechanical devices, all of which are used to exert some degree of pressure of the detached skin against the cartilage.

There is a marked tendency for serum or serosanguinous exudate to collect repeatedly following aspiration, due to the slowness with which the detached soft tissues again attach to the perichondrium, and to the difficulty of maintaining the desired degree of firm pressure upon the detached tissues and the cartilage.

Too much pressure is likely to cause pressure necrosis of the injured cartilage, while too little pressure fails to control the slow exudation.

With the use of a cast completely enclosing and modeling the ear, maintaining moderate pressure posteriorly as well as anteriorly, it is believed that favorable results can reasonably be expected in the average case as herein described.

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#### CYST OF THE URACHUS

By JAMES D. RIVES, Lieutenant Commander, Medical Corps, United States Navy

A surgeon may go a lifetime and never see more than one cyst of the urachus, as they are quite rare. For this reason it is considered desirable and of interest to the corps to report such a case, as so doing brings again to the attention a condition which, because of its rarity, is usually considered as of academic interest only.

On June 16, 1933, F. B. H., a gunner's mate, first class, United States Navy, was admitted to a surgical ward of the Naval Hospital, San Diego, with the diagnosis of abscess of the umbilicus. The history is as follows:

*Chief complaint.*—Pain and tenderness, with swelling about the umbilicus.

*Present illness.*—He first noted tenderness and pain in this region in May 1933. This condition has persisted since that time, draining at intervals. There has been no drainage for the past 3 or 4 days.

*Past history.*—Not important.

*Family history.*—Not important.

*Physical examination.*—Reveals a well developed and nourished white male, aged 32 years, and weighing 150 pounds. Temperature 100, pulse 90, respirations 20. No other abnormalities noted except that there is a circular area with a radius of 2 inches about the umbilicus, which is red, painful, and indurated.

On admission an unsuccessful attempt was made to evacuate pus from a supposed abscess about the umbilicus, following which, the patient was put to bed and treated with hot, moist dressings for a period of 6 days. He was then taken to the operating room and there an infected cyst of the urachus, about the size of a walnut, was discovered. This was filled with hair and caseous material, and was actively suppurating. The cyst was opened, cleaned, and curetted, and a drain inserted. The sinus discharged serous material until August 8, 1933, when the entire umbilicus and cyst were removed at operation and the abdomen closed as for repair of umbilical hernia.

The patient made an uneventful recovery and was discharged to duty on September 12, 1933.

Pathologist's report of examination of the tissue removed is as follows:

"Specimen consists of skin and subcutaneous tissue with a depression at one end (umbilicus). Extending from the center of the inner tissue is a cordlike projection about 4 inches long. Section through the depression shows that the skin dips down for an inch followed by a small, dark area, probably necrosis.

"*Microscopic examination.*—Section consists of epithelial and subcutaneous tissues. The skin is ragged and thin, forming a lumen, in the center of which there is an acute exudate undergoing canalization. The subcutaneous tissue near the skin shows round cell infiltration and a moderate number of giant cells.

"*Histo-pathological diagnosis.*—Acute and chronic inflammation with supuration."

The urachus is the upper, intra-abdominal portion of the allantois and the bladder is the lower portion. Normally, during the third month of embryonal life, the urachus begins to atrophy, and finally, at birth, exists only as a slender fibrous cord, extending from the apex of the bladder to the umbilicus, between the peritoneum and the abdominal wall.

Arrests in its development lead to the formation of fistulae and cysts. The most complete arrest of development leaves the urachus patent, with the consequent formation of a fistulous tract from the bladder to the umbilicus, which may or may not discharge urine. The tract may be so fine as to evade discovery until later in life, when some undue strain, such as obstruction to bladder outlet forces urine through the patent urachus.

The opening of the fistula is usually very small; sometimes not admitting even the smallest probe, but in other cases may admit a

large catheter. The appearance of the opening may vary from that of normal skin to a protrusion varying in size from that of a pea to that of a cherry. It may show as a little, firm, red, or purplish nodule.

If the urachus becomes only partially obliterated, with areas still patent, one or more cysts will be formed. In some cases the lower portion remains open and here a bladder diverticulum is found. At times there may be a cyst above the bladder and communicating with it. In such a cyst urinary calculi may be formed, which by mechanical irritation may cause, eventually, necrosis of the abdominal wall and the development of urinary fistula of the abdominal wall. A cyst of the upper extremity of the urachus may communicate with the outer air through an opening in the umbilicus. These, if the opening is very small, may escape detection until, by chance, the contents or the wall of the sac becomes the seat of inflammation, thereby drawing the attention of the examiner to the condition.

Diagnosis must be made between cyst of remnants of the vitello-intestinal duct, which is, in the embryo, a direct connection between the yolk sac and the primitive intestine and so will be lined with intestinal mucosa instead of skin, as is the case in cysts of the urachus, and parasitic cysts, the most important of which is the hydatid. The finding of echinococcus in the contents of the sac will clear the diagnosis in this instance.

The treatment is surgical and consists in complete excision of the sac.

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#### METASTATIC CARCINOMA SIMULATING THE BULBAR FORM OF ACUTE ANTERIOR POLIOMYELITIS

By PAUL RICHMOND, Lieutenant Commander; and CLIFFORD A. SWANSON, Lieutenant;  
Medical Corps, United States Navy

The following fatal case of generalized carcinomatosis which had been clinically diagnosed as the bulbar form of poliomyelitis following tonsillectomy was recently observed at the United States Naval Hospital, Canacao, P.I. A small epidemic of poliomyelitis was occurring in Manila and vicinity at this time. A rapidly fatal case of the ascending type of poliomyelitis had been admitted to the hospital 2 days after this case was admitted and another typical poliomyelitis case had been admitted 9 days later. Recent literature describing what is termed "neuro-diffusion" of the virus of poliomyelitis, in common with the virus of rabies and tetanus toxin, along the peripheral nerve trunks and determining the location of the paralysis in relation to the skin lesion, which may be

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regarded as the portal of entry, seemed to explain the etiology in this case. It was not until microscopic study of the autopsy material revealed that the small nodules found in the liver were adenocarcinoma that the real etiology was suspected.

Patient J. D. G. age 51, weight 145 pounds, chief boatswain, United States Navy, admitted to the hospital August 7, 1933, with a diagnosis of chronic bronchitis. Although he had a moderate cough for 3 weeks and lost 12 pounds in weight his chief complaint had been pain in the right sacro-iliac joint and extending down the right thigh to the calf muscles of the leg.

There had been no other recent illness. He had typhoid fever in 1905. A gastroenterostomy had been done in 1914 for ulcer with complete relief of symptoms. No other sickness had occurred in 30 years.

*Physical examination on admission.*—Eyes and adenexa normal.

*Ears.*—Membrana tympani normal. Hearing tests were not done but there was no obvious hearing defect.

*Nose.*—Slight external deformity of the nose to the right. There was a rather marked deviation of the nasal septum to the right and a perforation  $\frac{1}{2}$  by 1 centimeter, between the maxillary crest and vomer bone. Perforation was apparently a sequel to an old septal fracture.

*Sinuses.*—Transillumination normal.

*Tonsils.*—Moderate size. A "milky" exudate could be expressed from the tonsillar crypts. There was injection of the anterior pillars.

*Teeth.*—Nos. 30 and 31 had pyorrhoeal pockets. No. 2 pulp exposed.

*Neck.*—Negative.

*Chest.*—Scattered moist râles throughout chest. Rasping sound at the end of expiration on the left side, below the angle of the scapula, which was considered a friction rub. Friction rub heard in the right anterior axillary line.

*Heart.*—Sounds normal. Blood pressure 142/94.

*Abdomen.*—Negative.

*Genitalia.*—Left hydrocele. Prostate felt normal on palpation.

*Extremities.*—Pain on pressure over the right sacroiliac joint and on compression of the iliac crests.

There was general adenopathy.

There were several subcutaneous nodules, one near left nipple, one below left clavicle, and one anterior to the right axilla varying from pea size to hazel nut in size.

*Laboratory tests.*—1. Blood Kahn negative.

2. Urinalyses normal.

3. Blood counts and hemoglobin normal.

4. Sedimentation test 11 millimeters in 1 hour.

5. Electro-cardiogram August 8, 1933, normal.

6. Electro-cardiogram August 22, 1933, showed widening of Q.R.S. complex from 0.06 to 0.09 second with slurring of R wave near base line.

*Progress notes.*—A slight afternoon fever (99° F.) was present for 1 week. The pulse rate was between 80 to 90. Salicylates, radiant heat, diathermy, and massage of the leg produced only temporary relief. A tonsillectomy was done on August 14, 1933, under local anaesthesia. The sacro-iliac pain was aggravated but no other unusual symptoms were noted until August 21, 1933, when patient experienced severe headaches necessitating narcotics.

During the next week hoarseness and dysphagia developed. On August 28, 1933, teeth no. 30 and no. 31 were extracted. On September 1, 1933, patient complained of increased dysphagia, hoarseness, and also diminished hearing.

On examination there was slight edema of the uvula and both corniculate eminences and difficulty in adducting the left vocal cord. The pharyngeal reflex was present. There was also dizziness on standing, intermittent headaches, aggravated by noises or slight jarring. There was no nystagmus. On swallowing fluids there was regurgitation through the nose and aspiration into the larynx producing violent paroxysms of choking. There was complete aphonia the following day. On September 5, 1933, fluoroscopic examination was done with patient swallowing barium sulphate malted milk mixture. Patient could elevate pharynx and larynx during deglutition. There was a collection of barium in the pyriform sinuses. The cervical esophagus was open and filled with air. Much choking occurred during the act of swallowing and the barium mixture could be seen in the bronchi of both lower lobes. There was also regurgitation of barium through the nose. There was lagging of the right diaphragm.

On September 6, direct laryngoscope examination was done. Vocal cords were in the cadaveric position. The cords could be approximated only with extreme effort to phonate.

Esophagoscopy examination was done and there was an absence of the cricopharyngeal resistance to the esophagoscope and flaccidity of the esophageal walls. Hiatal contraction was normal. Conclusion: Paresis of laryngeal muscles, inferior constrictor of the pharynx and the Levator Veli Palatini muscles. Hearing by whispered voice less than 1 foot in each ear and 4 feet by ordinary conversation.

There developed an aspiration pneumonia on September 6 which persisted until September 13. Feeding was done through a stomach tube but this was so uncomfortable to the patient that right nasal intubation with a Jutte tube was resorted to for feeding. The pulse rate varied from 100 to 110 after the pneumonic process clinically subsided indicating also vagal paresis.

It was deemed advisable to change the tube on September 26 to the left nares because of a marked muco-purulent secretion from the right nasal chamber. During this procedure there was a regurgitation of stomach contents with aspiration and a second fulminating aspiration pneumonia developed.

Spinal puncture on September 14, 1933, revealed increased pressure, increased globulin, 16 cells per cubic millimeter, 47 milligrams, sugar per 100 cubic centimeters, gum mastic curve 111110 and negative Kahn.

Headaches were improved by spinal puncture. Spinal puncture on September 26, 1933, showed marked increase in globulin, 40 cells per cubic millimeter, gum mastic 123330 and Kahn negative.

Patient died on September 30, 1933, due to aspiration pneumonia. No improvement occurred in swallowing, speaking, or hearing up to time of death. Catheterization had been required for 3 days prior to death.

*Clinical diagnosis.*—1. Bulbar paralysis caused by the virus of poliomyelitis, with paresis of 8th, 10th, and 11th (cranial portion) cranial nerves.

2. Terminal broncho-pneumonia.

*Autopsy report.*—No gross pathology in the brain, or medulla.

Larynx, trachea, and esophagus normal as far as could be determined.

Gastro-intestinal tract normal except for injection of gastric mucosa and patent old gastro-enterostomy opening.

Broncho-pneumonia involving particularly right lung anteriorly and left upper lobe. Both lungs adherent. No lung abscesses or tuberculosis.

An area 3 by 5 centimeters, on anterior surface of right ventricle was whitish and had the appearance of a recent phenol burn. On cutting through this area the ventricular wall was thin and an old organized thrombus was adher-

ent to the endocardium. The right coronary artery was thickened and narrowed. The heart valves and aorta were normal.

There were several small cysts about  $1\frac{1}{2}$  centimeter in diameter in the upper pole of the right kidney. A white nodule was found in the substance of the left kidney. Otherwise the kidneys were normal. Spleen was normal.

On the surface of the liver were 6 or 8 small areas of dense cartilaginous consistency varying from pin head size to 1 centimeter in diameter. On section of the liver about 40 similar nodules were found scattered throughout. Several apparently similar nodules were found adherent to the stomach, pericardium and mesentery. The pathology was not recognized grossly. Several hard subcutaneous nodules seemed to be of the same nature.

*Microscopic examination of autopsy material:* Nodule in liver showed adenocarcinoma, liver tissue otherwise normal.

Nodule in kidney showed adenocarcinoma, kidney tissue otherwise normal.

Subcutaneous nodule from near left nipple 1 by 2 centimeters, was a lymph gland invaded by adenocarcinoma.

Nodules from peritoneum, parietal pericardium and from retroperitoneal tissue posterior to stomach ( $\frac{1}{2}$  by  $\frac{1}{2}$  centimeter) were lymph glands invaded by adenocarcinoma.

Numerous sections of the brain stem had failed to show any gross lesion but microscopic examination revealed two small carcinomatous nodules in the medulla which were located in the lateral areas. The exact level was not determined. These were considered to be the cause of the bulbar paralytic symptoms.

Another nodule of microscopic size was attached to the pia mater in the anterior sulcus of the pons.

The cardiac tissue showed an organized thrombus subadjacent to degenerated muscle fibers.

The location of the primary carcinoma was not determined. Neither the prostate nor the testicles had been examined at the autopsy as no symptoms indicated pathology there.

# NAVAL RESERVE

## MEDICAL CORPS

### APPOINTMENTS, FOURTH QUARTER, 1933

Name	Rank	Appointed
Meek, Raymond E.....	Lieutenant commander M.C.-V. (S).....	Oct. 3, 1933
Delprat, Guillaume D.....	Lieutenant commander M.C.-V. (S).....	Oct. 14, 1933
Klumpp, James S.....	Lieutenant commander M.C.-V. (S).....	Oct. 27, 1933
Watts, Charles E.....	Lieutenant commadner M.C.-V. (S).....	Nov. 2, 1933
Strange, William W.....	Lieutenant commander M.C.-V. (S).....	Nov. 29, 1933
Redding, John O., Jr.....	Lieutenant (junior grade) M.C.-V. (G).....	Nov. 3, 1933
Mell, Charles N.....	Lieutenant (junior grade) M.C.-V. (G).....	Oct. 11, 1933
Lipshutz, Joseph.....	Lieutenant (junior grade) M.C.-V. (G).....	Oct. 25, 1933
Barnshaw, Harold D.....	Lieutenant (junior grade) M.C.-V. (G).....	Oct. 2, 1933
Bower, Lester LeRoy.....	Lieutenant (junior grade) M.C.-V. (G).....	Oct. 3, 1933
Nelson, Jack N.....	Lieutenant (junior grade) M.C.-V. (G).....	Nov. 22, 1933
Hammersley, Eugene R.....	Lieutenant (junior grade) M.C.-V. (G).....	Dec. 13, 1933
Schneiersen, Sol Stanley.....	Lieutenant (junior grade) M.C.-V. (G).....	Nov. 25, 1933
La Victoire, Isaac N.....	Lieutenant (junior grade) M.C.-V. (G).....	Dec. 5, 1933
Child, Edward P.....	Lieutenant (junior grade) M.C.-V. (G).....	Dec. 11, 1933

### PROMOTIONS

Name	From—	To—
Covington, John M. C.....	Lieutenant (junior grade) M.C.-V.(G).....	Lieutenant M.C.-V. (G)
McKeever, Duncan Clark.....	Lieutenant (junior grade) M.C.-F.....	Lieutenant M.C.-F.
Sweetser, Horatio B., Jr.....	Lieutenant (junior grade) M.C.-V.(G).....	Lieutenant M.C.-V.(G)

## DENTAL CORPS

### APPOINTMENTS

Name	Rank	Appointed
Ennes, Ralph M.....	Lieutenant (junior grade) D.C.-V. (S).....	Dec. 5, 1933
McCall, John O.....	Lieutenant commander D.C.-V. (S).....	Oct. 5, 1933
Wrenn, H. Bradley.....	Lieutenant D.C.-V. (S), U.S.N.R.....	Nov. 29, 1933

### PROMOTIONS

Name	From—	To—
Dalitsch, Walter W.....	Lieutenant (junior grade) D.C.-V. (G).....	Lieutenant D.C.-V. (G), U.S.N.R.
Spector, Benjamin.....	Lieutenant (junior grade) D.C.-V. (G).....	Lieutenant D.C.-V. (G), U.S.N.R.









W. P. C. BARTON.

1786-1856.

The first chief of the Bureau of Medicine and Surgery.

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## NOTES AND COMMENTS

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### WILLIAM PAUL CRILLON BARTON

#### FIRST CHIEF OF THE BUREAU OF MEDICINE AND SURGERY

The first Chief of the Bureau of Medicine and Surgery was born in Philadelphia on November 17, 1786, of a distinguished Pennsylvania family. His father was a lawyer and also the designer of the United States Seal. His brother, John Rea Barton, devised the bandage known by his name, used in fractures of the jaw. His uncle, Benjamin Smith Barton, was the successor of Benjamin Rush as professor of the theory and practice of medicine at the University of Pennsylvania, and a distinguished botanist. He was a grand-nephew of David Rittenhouse, the astronomer.

Barton graduated at Princeton in 1805 and studied medicine under his uncle. He received his degree in 1808. He was appointed to the Navy on April 10, 1809, to take rank from June 28, and was ordered to the frigate *United States*, where he began a warm friendship with his commander, Stephen Decatur. The portrait here published undoubtedly shows him at about the time of his appointment or during the early years of his service.

He had many claims to distinction and was an early advocate of increasing the space used as a sick bay on board ship, and standardizing equipment and medical supplies for the medical departments of ships. He was a naval hygienist, the father of our naval hospitals, and urged a better system of recruiting. He was responsible for the idea of a medical library for each naval medical unit. He was an organizer and administrator of the highest integrity and ability. Like his uncle he was a distinguished medical botanist.

He died in 1856 and is buried in Laurel Hill Cemetery in Philadelphia. His most important published works are his *Treatise Containing a Plan for the Internal Organization and Government of Marine (Naval) Hospitals*, *Hints for Medical Officers Cruising in the West Indies*, published in 1840, and his *Medical Botany*, first published in 1818.

Though the first Chief of the Bureau of Medicine and Surgery, it is worthy of note that he was not the first Surgeon General, as that office for the Navy was not created until 1871 (Act of Mar. 3, 1871). Barton was appointed chief of bureau September 1, 1842.

**THE HENRY S. WELLCOME MEDAL AND PRIZE****COMPETITION FOR 1934**

The Competition is open to all officers, former officers of the Medical Departments of the Army and Navy, Acting Assistant and Contract Surgeons of the Army, Navy, Public Health Service, Organized Militia, United States Veterans' Bureau, United States Volunteers, and of the Reserves of the United States, commissioned medical officers of foreign military services, and all members of the Association. It is desirable, though it is not mandatory, that a competitor be a member of the Association of Military Surgeons.

A Gold Medal and a cash prize of \$500 will be given for the best paper on the following subject:

The Civilian Doctor's Part in a National Military Emergency.

Each competitor must furnish five copies of his competitive paper, and cannot write on more than one subject. Papers must not be signed with the true name of the writer, but are to be identified by a *nom de plume* or distinctive device. They must be forwarded to the Secretary of the Association of Military Surgeons of the United States, Army Medical Museum, Washington, D.C., so as to arrive at a date not later than August 15, 1934, and must be accompanied by a sealed envelop marked on the outside with the fictitious name or device assumed by the writer and enclosing his true name, title, and address. The length of the essays is fixed between a maximum of 10,000 words and a minimum of 3,000 words. The envelop accompanying the winning essay or report will be opened by the president of the association and the name of the successful contestant announced by him. The winning essay or report becomes the property of the association and will be published in *The Military Surgeon*. Should the board of award see fit to designate any paper for "first honorable mention" the executive council may award the writer life membership in the Association of Military Surgeons, and his essay will also become the property of the association.

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**CERTAIN RECIPIENTS OF THE NAVY CROSS GIVEN MEMBERSHIP IN THE LEGION OF VALOR**

The following notice will be of great interest to a large group of naval medical personnel who are holders of the Navy Cross given for heroism in military operations against armed forces.

At the forty-third annual reunion of the Legion of Valor of the United States, held in New York City, September 10, 11, 12, and 13, 1933, the constitution of the Legion of Valor was amended to allow holders of the Navy Cross awarded for an act of "extraordinary heroism" in connection with military operations against an armed enemy of the United States, to become members thereof.

Membership in the Legion of Valor previous to this amendment was restricted to holders of the "Medal of honor" of both the Army and Navy and the "Distinguished service cross" of the Army.

By far the greater number of holders of the Navy Cross in the valor class, obtained in military operations against an armed enemy of the United States, are found among those members of the Medical Department of the United States Navy who were detached from the Navy, by Presidential order, with the Fourth Brigade, United States Marine Corps, for service in the Second Division, American Expeditionary Forces of the United States Army during the World War.

There are 11 medical and dental officers and 50 members of the Hospital Corps of the Navy who are believed to be eligible because of service with the Fifth and Sixth Marine Regiments in Quantico. In addition, there are probably some other holders of the Navy Cross, received during the World War, who are eligible.

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#### POTENCY OF SMALLPOX VACCINE

It has been almost an axiom with the medical profession since the time of Jenner that vaccination will prevent smallpox. It would seem, therefore, that smallpox should be nonexistent in as highly a vaccinated group as the Navy. As a matter of fact, such is very nearly the case despite the greater likelihood of exposure incident to naval life, particularly on some foreign stations where smallpox of a peculiarly virulent type is often encountered.

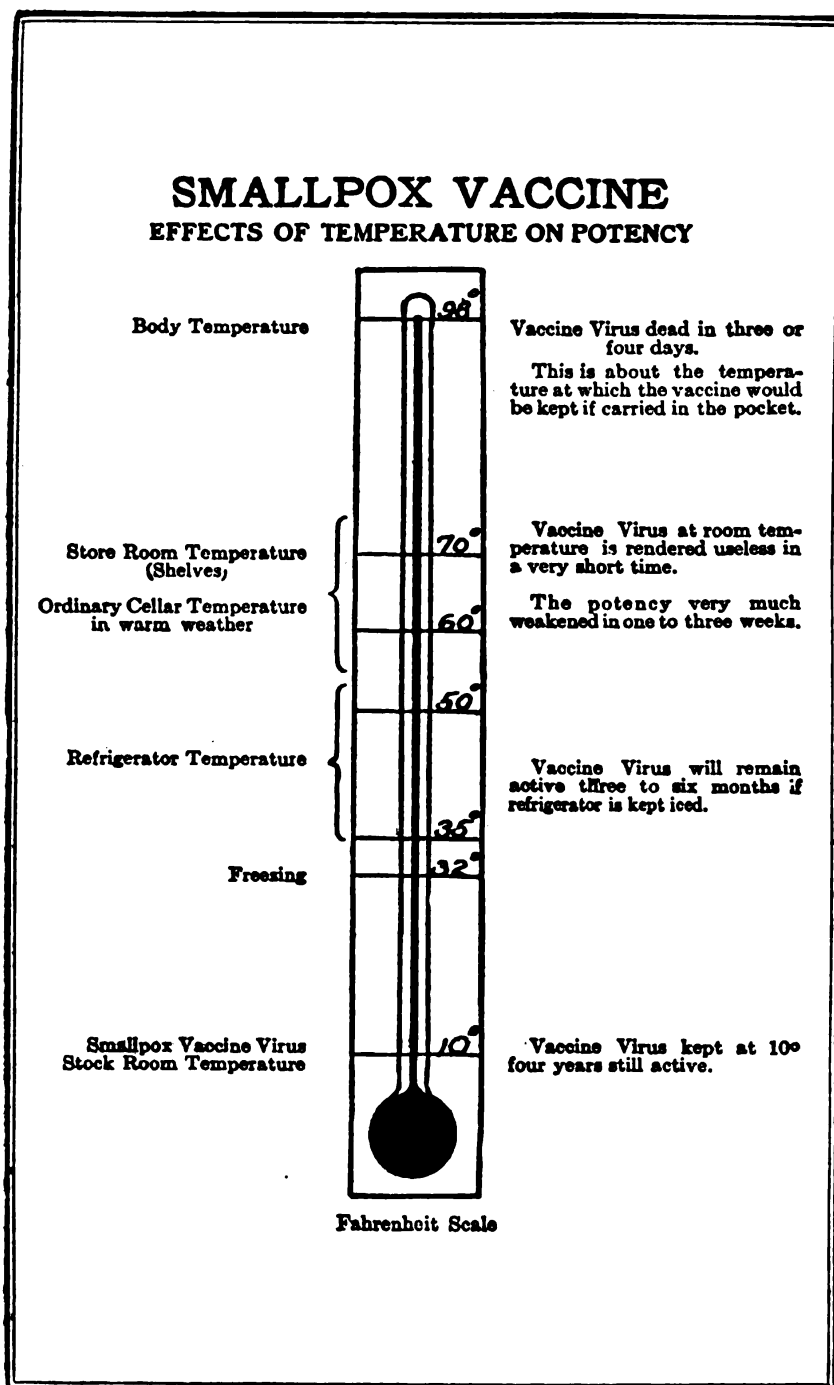
The exceedingly low incidence is due to the excellent regulations in regard to vaccination and the attention and care with which they are carried out by the Medical Department. There are, however, a number of factors to be considered in smallpox prevention, the two following being of prime importance:

1. Careful and repeated vaccination.
2. The use of a potent vaccine.

The first requirement is being well fulfilled in the Navy.

The situation as to the second requirement is not so satisfactory. Vaccines are often of low potency when used as indicated by the character of the reactions of immunity, and the low percentage of primary reactions. As a consequence little or no protection against some virulent types of smallpox such as are often encountered on the Asiatic station is conferred.

The weakness of the vaccine virus may be due to various causes. First of all, it may have been weak from the beginning, in other words, the vaccine when freshly made has little power because made from strains that have become attenuated. The experience, the skill, and the integrity of manufacturers and rigid requirements as to the purity of drug products have done much to lessen this possibility, still, it must always be considered in reference to smallpox vaccine.



Relation of temperature to potency of smallpox vaccine. (Courtesy of Eli Lilly and Company.)

The second most important cause is lack of maintenance of the vaccine at a low temperature. In general, it may be said that the keeping quality is in direct relation to the temperature. Vaccine kept at body temperature for 3 or 4 days is practically inert. There is a gradual lengthening of the lifetime of the virus as the temperature is lowered. This relation is graphically expressed in the accompanying diagram. Even exposure for a very short period to any but a low temperature undoubtedly affects the viability of the virus.

The lesson from this is plain. It is evident that to make smallpox vaccination most effective care must be exercised to obtain for use only vaccine of the highest potency, and maintain it at a low temperature both in transit from the manufacturer to the supply depots and from them to the ships and stations throughout the world. When received it should be kept at as low a temperature as possible to obtain for it, and only the amount to be used should be removed from refrigeration. Simple as these requirements seem to be, they are not easy to fulfill. Still there are no really serious obstacles to overcome and the result should be the virtual elimination of variola from the Navy.

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#### IMPORTANT ANNUAL MEETINGS IN 1934

The following are some important meetings of medical and scientific societies during the year 1934.

The American College of Physicians, Chicago, Ill., April 16-20, 1934. Headquarters, the Palmer House.

The American Medical Association, Cleveland, Ohio, the week beginning June 11, 1934.

The American College of Surgeons, Boston, October 15-19, 1934.

The Association of Military Surgeons, at the Army Field Service School, Carlisle, Pa. The date has not yet been determined.

The American Public Health Association, Pasadena, Calif., September 3-6, 1934. This is the sixty-third annual meeting.

The American Pharmaceutical Association, Washington, D.C., May 5-12, 1934. This is the eighty-second meeting and the new American Institute of Pharmacy Building will be dedicated. This will be the headquarters building of the American Pharmaceutical Association.

The American Dental Association, St. Paul, Minn., August 6-10, inclusive.

The American Association for the Advancement of Science, Berkeley, Calif. June 18-23, inclusive.

The American Association of the History of Medicine, Cleveland, Ohio, the opening day of the American Medical Association Session, June 11, 1934.

American Nurses Association, National League of Nursing Education, National Organization of Public Health Nursing. April 22-27, 1934, Washington, D.C.



## ADVANCES IN MEDICINE AND THE MEDICAL SCIENCES DURING THE YEAR 1933<sup>1</sup>

The following is a brief résumé or calendar of the more recent advances in the clinical branches of medicine, as well as the medical sciences. An attempt has been made to confine it to discoveries or important advances that were made during the past year, though this has not always been possible as some of the work extends several years back and has only become recognized during 1933. Furthermore, it is naturally not possible in so brief a compass as a few pages to mention but the most outstanding achievements. With work so recent, too, it is difficult to appraise with absolute accuracy that which will stand the test of future experience.

### MEDICINE

*The use of mucin and mucilaginous substances in the treatment of gastric and duodenal ulcer.* The successful use of mucin represents one of the most important advances made in the treatment of ulcer and has largely come to the forefront during the years 1932 and 1933. The mucin treatment of peptic ulcer in the International Medical Digest for October 1932, and limitations in treatment of chronic peptic ulcer with mucin in American Journal of Medical Science, 1933, give good views of the subject and the literature is increasing and includes the use of mucin in colitis. An interesting development is the advocacy of vegetable demulcents such as powdered okra.

*The synthetic preparation of 1, ascorbic acid considered to be identical with vitamin C* (T. Richstein et al., Polytechnic Institute of Zurich) and its successful use as a curative agent in a case of scurvy in man (Paul Schultzer, Copenhagen).

*The probable isolation of the active principle of the adrenal (cortin) and steps toward synthesis.* (Grollman and Firor, of Johns Hopkins, and Kendall and associates at Mayo Clinic.)

*Introduction of the use of dinitro-ortho-cresol and dinitrophenol as a specific treatment for obesity and overweight.* These drugs seem to have the effect of speeding up cellular metabolism. The most recent and easily accessible reference is the article of Cutting and Tainter in the December 30, 1933, Journal of the American Medical Association.

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<sup>1</sup>This material was prepared with the assistance of the staff of the Naval Medical School and Naval Hospital, Washington, D.C.

*The intravenous use of certain dyes in the treatment of leprosy, notably trypan blue.* A preliminary report on the use of dyes was made by G. A. Ryrie in the Transactions of the Royal Society of Tropical Medicine and Hygiene in June 1933, and a report on the use of brilliant green and crystal violet, by C. S. Ryles, in the Leprosy Review of July 1933.

*The use of methylene blue injected intravenously in the treatment of poisoning by cyanogen compounds.* The experimental work on animals reported by M. M. Brooks, American Journal of Physiology, October 1932, has followed by use of methylene blue clinically with apparently good results. Geiger, J. C., Journal of the American Medical Association, April 8, 1933. A number of case reports with favorable clinical results are to be found in the literature. However, the Public Health Service in the Public Health Report of December 1, 1933, do not give so enthusiastic a report as a result of their investigations. The question of its value still remains unsettled in spite of favorable clinical results reported. The dosage of 50 cc of a 1 percent solution is criticized as too high.

*Barbituric acid derivatives given intravenously to control the convulsions of strychnine poisoning* were used successfully (Kempf and associates in Journal of American Medical Association for February 25, 1933).

*An antidote in acute mercurial poisoning* is constantly being sought and a most promising one is brought forward by the Public Health Service in formaldehyde sulfoxylate. (Experimental Studies of Acute Mercurial Poisoning, S. M. Rosenthal, Public Health Report of December 29, 1933.) Both on experimental animals and in a few cases in which it was used clinically the results were excellent.

*Vitamins A and D as prophylactics against calculus formation.* Though the idea that calculus formation in the kidney and gall-bladder has a relation to food deficiency is not new, rather clear cut relationship was established between urinary calculus formation and deficiency in vitamins A and D by the work of Bliss, Livermore, and Prather, published in December 1933 Journal of Urology. In cases that have passed urinary calculi or had them removed, they suggest the clinical use of large amounts of these two vitamins as a means of preventing recurrence.

*Isolation of what is probably pure vitamin B in crystalline form* was accomplished by Seidell. (Journal of Biological Chemistry, March 1933.) Williams and Eddy in a report to the Carnegie Foundation report a large scale production method for this vitamin, obtaining 250 to 300 milligrams of the crystalline form from 50 kilograms of rice polish.

*In cardiology, the use of the fourth or anterior-posterior lead in electrocardiographic examination has been introduced and is apparently of value in showing obscure myocardial damage. (Lieberson and Lieberson, Annals of Internal Medicine, April 1933.)*

*The use of carbasone as an auxiliary in the treatment of amoebic dysentery came to the fore during 1933.*

#### SURGERY

*For penetrating stab wounds and bullet wounds of the chest, an old subject and one of great importance to military surgeons, a new operative procedure is described for dealing with lacerated lung tissue which features the "extrapleuralization of the damaged lung and illustrated in great detail. (Connors and Stenbuck, Annals of Surgery, April 1933.)*

*Skin grafting was the subject of considerable research during 1933. The full thickness skin graft, its limitation and its uses (Garlock, Annals of Surgery, February 1933) is a valuable contribution and the same number of the Annals of Surgery describes the use of a single layer of gauze to hold the ordinary Ollier Thiersch grafts into place, a method applicable to small deep grafts and apparently an excellent method for general use.*

*The use of new barbituric acid derivatives in intravenous anaesthesia was continued in 1933 and many reports made. Avertin and evipan sodium were extensively used.*

*An improved gall bladder technique designed to eliminate seepage and to permit closure without drainage in cases of uncomplicated cholecystectomy was described (de Courcy, Annals of Surgery, September 1933).*

*The more general use of electrosurgery in many fields was continued during 1933. A description of 118 operations by electrosurgical methods was described by Lilienthal in Annals of Surgery for June 1933.*

*In surgery of the lung improved methods of total pulmonary lobectomy with a two-stage technique was described. (Alexander, Surgery, Gynecology, and Obstetrics, March 1933.)*

#### PUBLIC HEALTH AND PREVENTIVE MEDICINE

*Texas has been added to the registration area for deaths, and now for the first time deaths are uniformly recorded throughout the whole United States.*

*Rocky Mountain spotted fever long thought to be endemic only in the northern part of the Rocky Mountain area has been found by United States Public Health workers to be endemic in most parts of the United States. A vaccine prepared from the infected ticks—*

*Dermacentor Andersoni* and *variabilis*—has been used with considerable success as a preventive measure. Immunity is not permanent. Control by attempted eradication of ticks has not been very successful.

#### OPHTHALMOLOGY AND OTOLARYNGOLOGY

*Pantocain as a substitute for cocain is strongly urged for nose and throat work.* (Lazlo, *Annals of Otology, Rhinology, and Laryngology*, September 1933.) It is only one fifth as toxic as cocain, not habit-forming, more stable and economical and but 3 or 4 minutes are required for anaesthesia after application. It is used for topical application only, as it cannot take the place of novocain for infiltration.

*Severe deafness in adults sufficient to constitute a handicap is due in the greater proportion of cases to otosclerosis and primary nerve deafness. Only 12 percent of severe adult deafness is due to middle ear disease in childhood.* (Shambaugh and associates, *Archives of Otolaryngology*, October 1933.)

#### ROENTGENOLOGY

In roentgenography the refinements in development of high-milliamperage technique, opening new fields in soft tissue radiography, are outstanding. In roentgenotherapy the introduction of new ultra-power X-ray apparatus and its employment in the treatment of malignancy must be mentioned.

#### OBSTETRICS AND GYNECOLOGY

*In recent years much work has been done to determine at what point in the menstrual cycle ovulation occurs.* A most noteworthy contribution during the past year is that of Hartman in his research on monkeys. He has definitely proved that ovulation occurs in the largest percentage of cases 13 days after the beginning of the last menstrual period. It may occur anywhere from the ninth to the twentieth day. The life span of the spermatozoa is not more than 24 hours and that of the ovum not more than a few hours. The work is of importance in shedding light on a live topic of the day, contraception. (Hartman, Carl G., *American Journal of Obstetrics and Gynecology*, October 1933.)

During the past year the trend in treatment of cancer of the cervix is toward radium therapy. Hysterectomy has been held to be the choice in treatment of cancer of the body of the uterus, but here, too, opinion is strong that radium offers just as good results in about 50 percent of the cases. (Healy, William P., *American Journal of Obstetrics and Gynecology*, December 1933.)

## ANATOMY

A notable contribution to gross anatomy, a subject in which it is not usual to consider as having had much new material added to it for a century, is the *study of anatomy in the living model and the effect of posture and movement upon anatomic relations*; a practical clinical feature. (Waterston, *Anatomy in the Living Model*, Hodder and Stoughton.)

*The application of X-ray to the study of normal gross anatomy* has also been emphasized in 1933. (Application of Roentgenology in Anatomy, *Ergebnisse der Anatomie*, Goldhammer, 30-420-468, 33.)

*Field for gross anatomic research exists in the study of anomalies*, their relation to surface anatomy and their clinical application. Another field for research is in the *Chromaffine glands* with study of the histology, embryology, and physiology of this system.

*The anatomy of the veins of the gall bladder.* (Kreider *Surgery, Gynecology and Obstetrics*, October 1933.) This is an interesting study in surgical anatomy showing that an impacted stone in the cystic duct would probably not cause venous stasis except in case of a very large stone.

## HISTOLOGY

The most important and practical advance in histology is the demonstration of *direct communication between coronary vessels and the heart*. Wearn and associated workers using colored celloidin coronary injections, serial sections, and wax plate reconstructions demonstrated clearly the direct communications. (*American Heart Journal*, Dec. 2, 1933.)

## EMBRYOLOGY

The most important development during 1933 in this science is the continuation of work of recent years in *experimental embryology* and the production of mutations by exposing the germ cell to various physical and clinical agents.

The Nobel prize in medicine for 1933 was given to an American embryologist, Dr. Thomas Hunt Morgan, well known for his researches in genetics.

## BACTERIOLOGY

*Development of a skin test to be used in the serum treatments of type I pneumococcus pneumonia as a guide to serum therapy and prognosis.* When the skin test became positive, recovery invariably followed. A negative skin test following the administration of serum was an indication that the serum therapy should be continued.

## PHYSIOLOGY

Localization of *postural adjustments and finger movements* in the premotor area was established by Prof. J. F. Fulton, of Yale University.

Further work on *cerebral localization* was done which placed the control for sweating, shivering, hiccoughing, yawning, blood pressure, and heart rate in the diencephalon. (Penfield, McGill University.)

Evidence was brought forward to show that *alcoholic cirrhosis* of the liver may not have alcohol itself as the etiologic agent, but phosphorus from the beverage containers.

Research by workers at the University of California, McGill University, University of Chicago, and the Rockefeller Institute on the *pituitary gland* indicate that it produces hormones affecting—(a) growth, (b) sexual activity, (c) sugar utilization, (d) milk production, (e) activity of the thyroid, (f) activity of the adrenal.

## PATHOLOGY

*Susceptibility to cancer* or to the irritants or factors causing cancer is transmitted by a single gene (Maud Slye, University of Chicago.)

A substance capable of *inhibiting the growth of certain types of cancer cells* was obtained from extracts of placenta and skin embryo. (J. B. Murphy, of Rockefeller Institute.)

*The irritant of coal tar* that apparently will cause skin cancer is benzpyrene. (Cook and others at London Cancer Hospital Research Institute.)

*Primary tumors of lymph nodes.* Prior to recent pathological studies, primary lymphoid tumors were classified according to their clinical behavior and considered to be not closely related. These neoplasms were divided into Hodgkin's granuloma, lymphosarcoma, lymphatic leukemia, and an ill-defined group, classified morphologically as round-cell sarcomas. More recent studies strongly indicate a close interrelationship of these lymphomas with intermediate transitional groups as Hodgkin's disease sarcomatous type, reticulum cell sarcoma, aleukemic leukemia, and mycosis fungoides.

## BOOK NOTICES

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Publishers submitting books for review are requested to address them as follows:

The Editor,  
UNITED STATES NAVAL MEDICAL BULLETIN,  
Bureau of Medicine and Surgery, Navy Department,  
Washington, D.C.  
(For review.)

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**INFECTIONS OF THE HAND.** A guide to the surgical treatment of acute and chronic suppurative processes in the fingers, hand, and forearm. By *Allen B. Kanavel, M.D., So.D., professor of surgery, Northwestern Medical School, Chicago; attending surgeon, Wesley Memorial and Passavant Memorial Hospitals, Chicago.* Sixth edition, thoroughly revised. Lee & Febiger, Philadelphia. 1933. Pp. 537, ill. 216. Price \$6.

Dr. Kanavel's book is too well known to require an introduction to anyone who is likely to read this review, but the change of form of this new edition is worthy of notice. The experimental work on which the principles of treatment are based have been subordinated to the practical application of those principles. This new arrangement makes it much easier to find out exactly what should be done for any particular case. On page 268 is a tabulation giving, for each finger, the probable routes of extension of infection arising in that finger and the page on which its treatment is described. The practical value of the book is greatly increased by the new arrangement.

It is repeatedly emphasized that there are two lesions—lymphangitis and suppurative tenosynovitis—which are still too often unrecognized and improperly treated. In lymphangitis, hasty incisions not infrequently lead to unnecessary loss of life, and in suppurative tenosynovitis the failure to institute early treatment leads to prolonged illness and permanent disability.

From any point of infection on a finger, on the palm, or the dorsum of the hand, infection may spread by three channels—lymphatic, fascial, or along the tendon sheaths. Each of these possibilities and the proper treatment are fully discussed.

Injuries and infections of the hand are such a prolific source of disability in the Navy and at navy yards that it would seem a good investment to provide this book for ships and stations where such lesions may occur.

(L. W. J.)

**A GERMAN DOCTOR AT THE FRONT.** (*Die Front Der Arzte.*) By *Prof. Dr. Wilhelm His*. Translated by *Col. G. M. Blech, Medical Corps Reserve and Brig. Gen. J. R. Kean, Medical Corps, United States Army (Retired)*. National Service Publishing Co., Washington, D.C., 1933. For sale by The Military Surgeon. Price, \$2.50.

*The great anatomist and embryologist, WILHELM HIS*, is one of the outstanding names in German science in the nineteenth century. His son became as famous as his father. The relation is described in a delightful paragraph in the preface to this book:

It is unusual for father and son to be alike distinguished in the same profession, but the younger His, whose experiences in the World War are told with much charm and a sweet philosophy in this little book, may be said to have written his name in the hearts of men by his studies in the anatomy and physiology of that organ, since the neuromuscular band which connects the right auricle with the ventricles is known to all medical students as the "bundle of His." It synchronizes the action of the auricles and ventricles, and disturbance of its function causes heart block.

During the war Wilhelm His "the younger" as a consultant and adviser went to nearly all the German fronts not only in Europe but in Asia. His description of conditions is excellent, often told with humor and always with understanding. His experiences in the Russian conflicts of 1914 and 1915, the western front and Turkey, Armenia, Mesopotamia, and Palestine are all related and convey a remarkable picture of the war from the German side.

**MANUAL OF DISEASES OF THE NOSE, THROAT, AND EAR.** By *E. B. Gleason, M.D.*, professor of otology, Graduate School of Medicine, University of Pennsylvania. W. B. Saunders Co. Philadelphia, 1933. Price, \$4.50.

This is the seventh edition of a manual intended to supply students and practitioners with a convenient general survey of the subject. The entire work has been rewritten and as it is intended as a reference book, the index has been much enlarged. An interesting feature is an appendix containing a large formulary full of commonly used and important prescriptions in ear, nose, and throat work. The whole book fills its field much as May's diseases of the eye has done in supplying information to the general practitioner on standard ophthalmic practice.

**PATHOGENIC MICRO-ORGANISMS.** By *W. H. Park, M.D.*, and *Anna W. Williams, M.D.* Tenth edition. Lea & Febiger, Philadelphia, 1933. Price, \$7.

This is one of the finest books on bacteriology published in America. It is comprehensive (867 pages) and the subject is presented in a clear and simple manner. The illustrations are notable, both the engravings and colored plates being exceptional as to quality. There is a large table giving the names, characteristics, morphological and cultural, and the pathological condition caused by practically all common pathogenic bacteria.



**DISEASES OF THE CHEST AND THE PRINCIPLES OF PHYSICAL DIAGNOSIS.** By *George W. Norris, M.D., and H. R. M. Landis, MD.* Fifth edition. W. B. Saunders Co., Philadelphia, 1933. Price, \$10.

This new edition of Norris and Landis continues to emphasize the practical and clinical side of diagnosis of the various chest conditions.

**METABOLIC DISEASES AND THEIR TREATMENT.** By *Dr. Erich Grafe, professor of medicine, University of Wurzburg. Translated by Margaret Galt Boise.* First American edition. Lea & Febiger, Philadelphia, 1933. Price, \$6.50.

The translation of this important work by one of the great German clinicians of our day was done under the supervision of Dr. Eugene DuBois and Dr. Henry Richardson, of Cornell University Medical College. Though the scientific aspects, the pure physiology back of these disorders, are carefully explained by Dr. Grafe, the whole purpose of the book is to give the physician dealing clinically with these cases confidence and assistance in treating them. Diseases such as diabetic mellitus and insipidus obesity and under-nutrition are given particular attention.

**OBSTETRICS AND GYNECOLOGY, Vol. III.** Edited by *Arthur H. Curtis, M.D., head of the department of obstetrics and gynecology, Northwestern University Medical School.* W. B. Saunders Co., Philadelphia, 1933. Price, \$35 the set.

This volume completes what amounts to an encyclopedia of the two subjects and is concerned largely with gynecology. A feature is the extensive treatment of obstetric roentgenology. The large series of fine illustrations make these volumes an atlas as well as an encyclopedia.

**SURGICAL ANATOMY.** By *Grant Massie, M.B., M.S. (London), F.R.C.S. (England), assistant surgeon, Guy's Hospital; surgical tutor, Guy's Hospital Medical School; examiner in anatomy, for the Fellowship of the Royal College of Surgeons of England.* Second edition. Lea & Febiger, Philadelphia, 1933. Pp. 441. Ill. 147. Price, \$6.

An excellent volume, containing all the essential facts of surgical anatomy, briefly and clearly stated. Designed for the use of students preparing for examinations and is well adapted for such use.

(L. W. J.)

**INDUSTRIAL HEALTH SERVICE.** By *L. D. Bristol, M.D., health director, American Telephone & Telegraph Co.* Lea & Febiger, Philadelphia, 1933. Price, \$2.

This is a brief résumé of industrial health problems and is intended to direct employers and supervisors of labor to a definite industrial health program.

**BACTERIAL INSPECTION.** By *J. L. T. Appleton, Jr., D.D.S., professor of microbiology, Evans Museum and Institute of Dentistry, University of Pennsylvania.* Second edition. Lea & Febiger, Philadelphia. Price, \$7.

In the first part of the book the author deals with the biological characteristics of bacteria, such as the morphology, and physiology. Their classification, as described by Bergey, Migula, and Chester, is similar to other standard texts.

The second part, dealing with the nature of bacterial infection, the method of invasion, and the action of the host, gives the reader the fundamentals which are necessary for a thorough understanding of bacterial invasion.

In the third part the author has given a scholarly description of special infections in the mouth dealing with infections of the teeth, such as periapical affections, and allied conditions, as well as their treatment.

The illustrations and charts tend to stimulate deeper interest in the subject giving the reader a clearer picture of the condition described.

The book is of particular interest to the dental profession, especially to those interested in focal conditions originating in the mouth.

## THE DIVISION OF PREVENTIVE MEDICINE

S. S. COOK, Lieutenant Commander, Medical Corps, United States Navy, in charge

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### INSECT CONTROL

Although the literature dealing with the various aspects of insect control is extensive and excellent, much of this information is not generally available to the service at large. For this reason it seems worthwhile to bring together in a single article a summary of practical methods that may be useful to those who are called upon to deal with this vexing problem.

It may be stated at the outset that the degree of success attained will depend largely on the interest, ingenuity, and energy of the person making the effort. Haphazard, half-hearted measures can only result in failure.

A working knowledge of the life history and breeding habits of the insect is essential. One should be thoroughly familiar with such facts as where to look for breeding places, what the preferred breeding situations are, the length of time required for development of the egg into the adult, and temperature requirements. This information is invaluable in a saving of time, energy, and money.

It is also important to know what stage of the life cycle is most vulnerable. In the case of mosquitoes the larvae are more easily destroyed than either the eggs, the pupae, or the adults. The eggs are relatively resistant to chemicals, pupae do not feed, and adults are so widely dispersed as to make it difficult to destroy them in large numbers except when in a room or other confined space. Larvae on the other hand are voracious feeders, susceptible to toxic agents, and can be easily found in water deposits.

With some of the other insects it may be advisable to attack them at more than one point. An important feature of sanitation on shore stations is the development of an organization upon the members of which is placed the responsibility of maintaining satisfactory sanitary conditions. For this reason, the make up of such an organization has been set forth in the section on mosquito control.

*Mosquitoes.*—Preliminary to a discussion of mosquito control it is deemed pertinent to define in as accurate terms as may be practicable what is meant by the phrase mosquito control. Such a definition

is not easy to formulate as the phrase is not similarly interpreted by all workers in this branch of sanitation; some regarding it as synonymous with eradication of all species of mosquitoes, others as applying only to certain varieties of mosquitoes, while still another group think of mosquito control as measures leading toward restriction of production of certain species.

Considering, as I do, the latter construction of the phrase as a logical workable one, mosquito control may be defined as the effort to so restrict the production of adult mosquitoes as to render them noneffective. Such a definition is applicable to pestiferous mosquitoes as well as to the disease vectors.

Before proceeding with actual plans for the campaign a mosquito survey of the area under consideration should be made. For the purposes of such a survey mosquitoes may be conveniently divided into two groups, namely the mosquitoes which are a menace to the health of the community by transmitting disease, and secondly those which are nuisances in that their bites cause annoyance to the inhabitants of the community.

The prevalence of members of the two groups can best be determined by a field survey during the season of the year when temperature conditions are favorable for the propagation of the species. If for uncontrollable reasons this is not feasible certain information may be obtained in other ways. A similar survey may have been done in the same vicinity, or an adjacent one, in which event records of it may be available for study. The local board of health may have valuable data in its files or some private agency may have records of what mosquitoes are likely to be found there.

In making inquiries as to the prevalence of mosquito-borne diseases, hospital records, board of health files, private physicians, and industrial organizations are the best sources of information.

Considering further the disease vectors one should be thoroughly familiar with the four mosquito-borne diseases especially with regard to their geographic distribution. Malaria, with the widest range of them all, may be found anywhere between the parallels of 40° north and 40° south. Dengue, though less widely distributed than malaria, may be found throughout the subtropical and tropical portions of the world. Filariasis has what may be termed a peculiar distribution. Unlike many other insect-borne diseases its prevalence does not coincide with that of its vector. Wherever it does occur active steps must be taken to suppress its mosquito transmitter. The fourth and final member of the quartet, yellow fever, has, so far as is known at present, a rather limited spread. There are only 8 known endemic foci of this disease—1 in Africa, 1 in Brazil, and a third in the interior of Colombia.

All possible sources of information should be consulted before proceeding with the field survey.

When investigating the prevalence of pestiferous mosquitoes reliable information may often be obtained from hotel men, real-estate operators, and citizens of the community.

A good map is an indispensable adjunct to an accurate mosquito survey. If none can be procured from commercial or other sources one must be made as the survey progresses. The principal points to be noted on the map are the location and direction of flow of streams, location of all ponds, whether natural or artificial, location and extent of marshes and swamps, the proximity of inhabited dwellings to water, and finally the types of mosquitoes found in the various water deposits.

Unfortunately, the accurate charting of existing water collections may not complete the picture. An outstanding exception may be found along the Atlantic coast from New England to Florida and thence along the entire Gulf coast. In this vast expanse of shore line are millions of acres of salt marshes whose upper reaches afford perfect breeding conditions for *Aedes taeniorhynchus* and *Aedes sollicitans*. These terrible tormentors of the human race lay their eggs on dry ground above the daily tide level. These eggs with their protecting cover may lie for months or maybe years until rains or high tides fill the depressions in which they are lying. Hatching takes place quickly, and within a few days complete development to the winged adult has taken place. They must be taken into account in any survey of coastal lands.

Inland, certain species of the genus *Psorophora* have similar habits. They lay their eggs in depressions that will later be filled with rains.

Other examples could be cited but these suffice to indicate the importance of potential as well as actual water collections.

During the progress of the survey samples of larvae should be taken into the laboratory for determination of species, and likewise every opportunity should be utilized for the capture and identification of adult mosquitoes. While it seldom happens that sufficiently complete data can be collected during a survey to plot accurately on a map the breeding locations of each species of mosquito, it is worth while to record all facts obtained.

At the completion of the survey the compilation of data should cover:

1. Description of topography of area.
2. Rainfall and temperature records.
3. Population.

4. Types of mosquitoes found with an estimate of their relative prevalence and importance.
5. Description of streams, ponds, and other collections of water.
6. Sketch of feasible drainage with its extent.
7. Estimate of extent of mosquito-breeding area that will require the use of oil or paris green with the amount of oil and paris green needed.
8. Estimate of cost—
  - (a) Cost of clearing streams and their banks.
  - (b) Number and extent of ditches with cost.
  - (c) Gallons of oil and its cost.
  - (d) Pounds of paris green and its cost.
  - (e) Pounds of diluting powder for the paris green with its cost.
  - (f) Cost of personnel—
    - (1) Administration.
    - (2) Field.
  - (g) Transportation.

The next problem to face after the completion of the survey and estimate of cost of the project is the procurement of funds. No general rules can be laid down except to state that the more painstaking and definite the preliminary survey the better the chances of making favorable appeal to those who control the necessary finances.

With the necessary money assured to inaugurate and carry on the campaign an adequate organization must be set up. An office is to be secured as conveniently located as practicable with space for desks, files, laboratory equipment, running water, and electric lights.

The administration or office force should consist of as many clerks as are necessary to handle incoming and outgoing correspondence and to properly care for all reports from the field force. In this office also must be kept accurate and daily records of the expenditure of money as well as expenditure of materials.

It is usually convenient to have a laboratory in the same building and adjacent to the administration office. If the size of the project does not warrant the employment of an entomologist, someone should be trained to identify, at least, the mosquitoes common to the locality. The laboratory equipment, as a minimum, should consist of a binocular entomological microscope, wide-mouthed bottles for rearing larvae, lantern chimneys with gauze covered tops for emerging cages, pasteboard pill boxes and entomological pins, medicine droppers for handling larvae, chloroform for killing mosquitoes, and, of course, a record book, pencils, paper, etc. A necessary item of equipment for the laboratory is a book with a key to the mosquitoes of that part of the world.

The field force consists of sanitary inspectors, chauffeurs, oilers, drainage gangs, and other laborers as may be needed.

The chief sanitary inspector, whose duties comprise general supervision of the whole layout, should be carefully selected and must have a working knowledge of the mosquitoes and their breeding places and must be reliable. His equipment and also that of the sanitary inspectors working under him should consist of:

1. A hollow-handled white enamel dipper of 1 pint capacity.
2. Pencil and notebook.
3. Catching tube. A large test tube filled for a distance of 2 inches with rubber bands on which chloroform is poured. Over them is placed a plug of cotton and on top of the cotton a round disc of cardboard. The tube is kept tightly corked when not in use.
4. Pasteboard pill boxes half filled with cotton. These are for captured mosquitoes.
5. Large mouthed bottles with labels for collecting larvae.
6. Medicine dropper with the end filed off for transferring larvae to bottles.

The sanitary inspectors are assigned to districts with instructions to cover them thoroughly and report all mosquito breeding. They are held responsible for the control of all mosquito production within the limits of their districts. Their reports of breeding are turned over to the oil and paris green inspector or drainage foreman, as the case may be, but the final responsibility for handling the situation rests with the sanitary inspector.

The size of the district is usually such as to require about 7 working days to cover it. In addition to sanitary inspectors who have regularly assigned districts it is sometimes advisable to detail one or more inspectors to check on oil and paris-green gangs. In this case these inspectors are furnished with lists of places to be oiled (or treated with paris green) and they in turn pass the work along to the gangs.

The drainage force is variable, depending on the magnitude of the project. In large organizations such as those seen in the salt marsh area in New Jersey there are engineers who plan the drainage and supervise the operation of the large and expensive ditching machines, operators and mechanics for the machines, and many other employees connected with different phases of the work. From this type of setup, which is probably the most elaborate of any in the United States, there are gradations down to the simplest one consisting of a few laborers with picks and shovels.

Much time and money can be saved by procuring adequate motor units in advance of the commencement of operations. Men and materials must be transported quickly and regularly if lost motion is to be avoided.

After completion of the organization and procurement of materials for office and field use the next consideration that presents itself is to determine what water collections are to be treated with larvicides and which ones are to be drained. It is not possible to go further than the presentation of a few general rules that may apply.

The initial cost of drainage is greater than those of larvicides, and as a rule control of the situation can be obtained more quickly with them than by drainage. On the other hand drainage is more permanent and in the end may not cost as much as continued applications of larvicides. Again, there are many places where the cost of drainage is so great as to preclude the possibility of its being instituted. Another trying situation is encountered along the seashore where the marsh may be below sea level. Obviously, the only answer is use of larvicides unless filling is to be considered.

Having decided which areas are to be drained and which are to be treated with larvicides it is in order to consider each of these procedures in detail.

Drainage may be accomplished by either open drains, also known as surface drains, or closed drains, which are often referred to as subsoil or subsurface drains.

Open drains will naturally vary in size and extent depending on the contour of the land, the volume of water to be moved, the nature of the soil, and various other factors. The prime requisite in any ditch large or small, short or long is straightness. Every bend and every angle mean decreased drainage efficiency. Also, angles in banks promote erosion by flood waters with resultant pockets or indentations which afford favorable breeding places for mosquitoes, particularly certain species of anopheles. Open ditches may be dug by machines constructed for the purpose, by hand labor, or by dynamite. As ditch-digging machinery is in general rather expensive its use is confined to projects of considerable magnitude. There is, however, a small outfit known as a ditch-digging plow that has a limited field of usefulness. It can be used only where ditches are being carried through fairly solid ground. It is pulled by horses or tractors which must have a solid footing. Ditch digging by hand labor is the most commonly employed method, but except in countries where the cost of labor is abnormally low it is expensive.

The use of dynamite has proven quite satisfactory in drainage work in many parts of the United States. It has no serious drawbacks, but it does not do so well in dry ground; it is dangerous and requires experienced personnel to handle it. When fired by propagation the dynamite must be 60 per cent nitroglycerin. The scheme of its use is briefly this: The line of the future ditch is staked off and the desired depth determined; holes are then made with a crowbar to



within 6 inches of the depth the ditch is to be made, the sticks of dynamite are placed in the holes and tamped down with a stick. The holes are 18 inches apart, and a row about 150 feet long can be set off at one time. When all the charges have been placed two fulminate of mercury caps are attached, one to each end of the row of charges. These caps are then attached by long lead wires to a battery box at a distance away. When the charges are exploded most of the dirt in the ditch line is blown straight into the air and then falls to the ground along or near the banks of the ditch. This method is only applicable in wet earth. If dynamite is used in dry ground all charges must be wired.

Open ditches not only serve as outlets for water to streams but also collect surface water en route. It is therefore important when piling the dirt taken from a ditch to leave space between the piles so that surface water may run into the ditch. Failure to observe this precaution defeats one of the functions of an open drain.

To prevent erosion of the banks of open drains they may be lined with bricks, tile, cement, or wooden stakes. Brick are expensive and are seldom used in modern times. Cement tile made in circular forms and cut, while wet, into half or third sections serve well for lining open drains. They can be made as needed and are cheap. By leaving space between the sections ground water seeps through into the drains. For larger drains and permanent construction reinforced concrete is probably the most satisfactory lining material. In certain places wooden stakes driven close together along the banks of a ditch function well in preventing caving of its banks.

The maintenance of open drains is always troublesome and frequently expensive. Unlined ditches are harder to keep clean than lined ones and it is also more difficult to keep the banks free from grass and weeds. A very useful device for cleaning drains is that known in Panama as a "Whale." It consists of a bunch of rope tied together with a long rope pull. When soaked in oil and dragged along the bottom of the ditch, trash and algae are swept out and a thin film of oil left behind.

Closed or subsurface drains are of great value in many situations. In boggy, swampy land, where the ground water level is high, closed or tile drains are more practical than open ones. They have the drawback of being more expensive to construct than the open type but as they require little or no upkeep and do not interfere with the use of the land for agricultural purposes the initial expense is not an important consideration. During the progress of the development of this type of drainage a number of different materials have been used. Sir Malcolm Watson in his most excellent book, "The Prevention of Malaria in the Federated Malay States", gives in the chapter on

drainage a complete discussion, with historical background, of sub-surface drainage.

Any device that permits free flow of water along the bottom of the ditch will serve the purpose. Hollow cement tile made in 12-inch lengths and in two sizes, 6 inches in diameter and 8 inches in diameter, fulfill practically all requirements. These tiles are easy to make, not too costly, and require very little equipment and almost no trained help. The layout consists of a drying shed, a tile making machine with molds for the two sizes, sand, and cement. The machine which is hand operated and inexpensive is nailed to a post of the shed. The sand is sieved and mixed with the cement in the proportion of 1 part of cement to 3 parts of sand. Enough water is added to hold the mixture together when placed in the molds. The tiles are molded and then laid in the drying shed for 2 weeks.

In constructing ditches that are to be later converted into closed drains no special precautions are necessary except that wherever possible the bottom of the ditch should be below the root level. Otherwise the roots will grow into and block the tile and in a comparatively short time the ditch is put out of commission.

As the primary purpose of closed drains is the interception of ground water one should always remember Sir Malcolm Watson's dictum, "To drain an acre of ground, ditch around it and not through it." A practical point which may save useless ditching is to dig all the ditches that are thought to be necessary in a given area. Then leave these open until assured that they are sufficient. There is no known rule of thumb or any other way of telling in advance how many ditches will be required. It is much easier to change the course of a ditch and to add a few short ditches here and there than to have to tear up the tile drains to find out the trouble.

The laying of tile should be done carefully and to level; the sections are laid end to end on the bottom of the ditch and the joints left open to allow entrance of water. After the tiles are in place rock of graded sizes running up to a top layer of gravel are laid over the tile. This rock layer should not be less than 6 inches thick. The ditch is then filled with dirt.

A combination of open and closed drains are sometimes used. These are often called "Double deckers." In this event the tile are placed as just described and instead of closing the ditch with dirt, half section cement tile are laid over the circular tile. The latter carries off ground water while the open drain carries off storm and surface water.

Oil is one of the oldest and in some respects the best larvicide for general use.

One of the first questions to be considered in regard to oil is how it kills larvae. Although the exact mechanism of its lethal action

is unknown it is believed that the death of larvae is caused by some toxic substance. The assumption which formerly held, that oil kills by suffocation is no longer tenable. Larvae can and do live for several days under a heavy layer of an inert oil, such as mineral oil, while larvae exposed for a few minutes to an almost invisible surface film of kerosene die promptly.

The efficacy of different oils may be summed up in the one sentence, "The toxicity of an oil varies directly with its volatility." The highly volatile hydrocarbons such as gasoline and kerosene are very efficient larvicidal agents but they are too expensive to be used in practical field work. Crude oil either, as is, or mixed with kerosene is a satisfactory oil to use. It is a heavy black oil and tends to collect in blobs on the surface of the water. It sprays better and forms a thinner film on water surfaces if mixed with a lighter oil.

Castor oil increases the filming qualities of any oil to a marked extent. It imparts this property in as low dilutions as 1 part to 100 by volume. In some places it has been found that oil drained from the crankcases of motors could be used to advantage in mosquito control. The toxicity of crankcase oil depends largely on the amount of kerosene and gasoline that have been added to it. Kerosene that has been used to wash motors and other machinery around the garage is often dumped in the barrel with the used crankcase oil. Gasoline finds its way into the oil in the same manner and also through poorly fitting piston rings.

There are many ways of distributing oil over water surfaces. The principal methods are:

1. Knapsack sprayers.
2. Oil-soaked sawdust.
3. Drip pans.
4. Under pressure and mixed with water.
5. Hot from special apparatus as in Panama.
6. Airplanes.

Of all the various types of oil sprayers the one known as the knapsack is perhaps more widely used and is certainly as practical and foolproof as any. With the curved side it fits comfortably on the back of the oiler, it has few parts to get out of order, is not unduly expensive and with reasonable care will last a long time.

Oil-soaked sawdust can be used to great advantage in pools and ponds. A box or bag of it can be thrown in and will give up oil slowly, thus maintaining a film on the surface for weeks.

Drip cans or barrels, formerly in greater vogue than at present were designed for use over running streams. It was thought that the slow dripping of oil on the water as it ran under the barrel would be an easy, economical way to get a film of oil on the surface

of the water. A practical difficulty arose in that the drip opening would become clogged. If it was made large enough to let sediment through, the oil would flow too fast and be wasted. Also, the changing viscosity of oil with the night and day temperatures made it almost impossible to adjust the apparatus to ensure a uniform rate of flow for the entire 24 hours.

The development of the hydroelectric plants with their large artificial lakes introduced a new problem in mosquito control. The edges of these large bodies of water had to be patrolled weekly. Some of these lakes have shore lines of hundreds of miles. To control mosquito production under such conditions requires ingenuity and careful planning.

An apparatus devised by Coggeshall for oiling the shore lines of lakes consists of a boat in which is mounted a tank of oil, a tank for compressed air, and a pump for distributing the oil. The oil is forced out under high pressure mixed with water. The pressure is sufficient to tear to pieces masses of flotsam along the banks. When the water quiets down a film of oil is left on its surface.

There are places throughout the world where mosquito breeding goes on in situations that are accessible neither by boat nor on foot. To reach such places the aerial route seems like the only possible approach. Within the past 5 years experiments have been carried on with the hope of perfecting an apparatus to spray oil from an airplane. The first work done along this line was carried out at Quantico, Va., in 1927. The writer and his associates of the United States Public Health Service with the active cooperation of Marine Corps aviators conducted several flights. A tank was mounted in the after cockpit of a two-seater plane. Through an opening in the fuselage the tank was connected with a hose that was secured to the under surface of the plane. The valve controlling the flow could be opened and closed as desired. The results were rather disappointing, as no device used gave the rapid discharge of oil which was desired. Since then an apparatus has been devised at Mare Island, Calif., and is being used with good success.

"At the present time and for several months past the mixture used has been one half pound of paris green ground into 1 gallon of low-grade diesel oil in the same manner as mixing paint.

"This method of distribution is as follows: The after cockpit of a T4MI Martin bomber is equipped with a 50-gallon galvanized tank about 16 by 55 inches and tested to 100 pounds pressure, lying horizontal and extending forward under the center cockpit. The bottom of the tank has a three fourths inch pipe connection which drops down about 12 inches, then reduces to a one half inch pipe and runs aft and down through the fuselage to the bottom of the verti-

cal rudder. At this point there is a venturi tube about 18 inches long, 8 inches diameter forward, 3 inches center and 6 inches aft. The pipe line is equipped with a one half inch plug cock which is operated by a lever from the after cockpit. The forward end of the tank has a 1½-inch pipe connection which extends up and out over the fuselage with a 1½-inch pipe plug which can be easily removed to permit filling of the spraying mixture. At the after upper end of the tank there is a small one-fourth inch pipe connection from which there is a copper tube running to a 15-pound CO<sub>2</sub> bottle filled with 1,000 pounds pressure of air; on the top of the bottle is a high-pressure valve, hand operated, which allows the air to go through a reducing valve, at 15 pounds pressure, which in turn, forces the paris green mixture through the pipe to the venturi tube after the plug cock has been opened.

"CO<sub>2</sub> for supplying the pressure was tried in several ways but inevitably trouble was experienced due to frosting of the reducing valve or freezing up of the pipes. No such difficulty is experienced with the compressed air.

"The amount of the mixture used is about 1 gallon per acre. From 400 to 800 acres of breeding land are sprayed every 2 weeks. This wide difference in number of acres sprayed is dependent on local conditions of dredging, etc.

"The speed and height of flying are not exact. The height varies due to different hazards which confront the pilot in the area to be sprayed, and this height varies from 20 to 40 feet, and the speed varies from 70 to 80 miles per hour. At this speed under the conditions outlined above, the mixture covers an area about 60 feet wide.

"The experience here has indicated that spraying at regular intervals 2 weeks apart has practically eliminated the mosquito pest on Mare Island. It may be possible to extend the interval but this is doubtful at present because mosquitoes blown in from Tubb's Island and other vicinities where there is no abatement work being done would have an opportunity to breed here.

"One 15-pound CO<sub>2</sub> bottle of compressed air is required for each 50-gallon drum of mixture sprayed.

"The time consumed for one flight, including filling the tank in the plane and changing the air bottle is about 20 minutes.

"In addition to the pilot, one man is required to operate the valves and inform the pilot when the tank is empty."

Since the discovery by Barber and Hayne in 1921 that paris green was an efficient larvicide its use has extended throughout the world. It has superseded oil in many places and where only anophelines are being attacked. Applied dry it has the disadvantage of not being effective against subsurface and bottom feeding larvae. *Anopheles*

larvae feed at the surface, their bodies lying parallel to the surface of the water. During feeding their mouth brushes move actively, creating a current which sweeps floating particles of paris green into the mouth. The larvae of all other types of mosquitoes feed below the surface, or on the bottom if the water is shallow. It has been found that paris green mixed with moist sand will sink and applied in this way is a satisfactory larvicide for all types of mosquitoes.

From time to time there are reports that certain lots of paris green are not toxic. For this reason all new shipments should be given a field trial before their acceptance. There are several methods of applying paris green to water surfaces, the choice depending largely on the size of the area to be covered. It is always mixed with some diluting powder, the most common being hydrated lime and powdered soapstone. While lime is more universally available and cheaper than soapstone it has the disadvantage of irritating the eyes and hands of the users and it also clumps in wet weather. Soapstone does not clump easily and can be dried out when it does and has the further advantage that it is nonirritating. Either is mixed in the proportion of 1 pound of paris green to 20 pounds of the diluting powder. For small streams and ponds this mixture is applied by hand or from a portable dusting machine. For large ponds a power duster mounted in a boat is used. Somewhat higher concentrations, as 10 to 15 percent by weight, are used in this apparatus.

For application of paris green to situations that are not accessible by boat, airplanes have been used with great success. In this method a hopper is mounted within the fuselage of the plane with an opening into a venturi tube secured to the under surface of the fuselage. The mixture for this method of application should consist of 30 pounds of paris green to 70 pounds of diluting powder. With a flying speed of 60 miles per hour, an elevation of 30 to 50 feet, and a wind velocity not exceeding 10 miles per hour a plane can quickly and efficiently cover hundreds of acres of breeding areas.

An essential part of any mosquito-control program is a system of checking on results. There are several ways of finding out whether the desired degree of success is being obtained.

Generally speaking the degree of diminution in the number of mosquitoes indicates the degree of control.

If the mosquitoes against which control measures are being directed are vectors of some disease decreased prevalence of that disease may be used as a check. If pestiferous mosquitoes are being attacked their degree of decrease may be used as a check on results.

The efficiency of larvicides can only be verified by examination of the water before and after their application. It is very simple. If one finds larvae before and 4 hours afterwards finds none the answer

is obvious. It is not always so easy to determine whether there has been a decrease in the number of adult mosquitoes. Information derived from inquiries among the population is of very slight value. The reaction of individuals to mosquitoes and their bites vary so widely that little dependence can be placed in statements of "No mosquitoes", "Millions of them", "More mosquitoes than in 20 years", "I haven't seen one this summer", and others of the same kind.

The method of checking must be selected for the particular locality. As an example, at Quantico the principal sources of *Anopheles quadrimaculatus* are two creeks, one to the north, the other to the south of the military reservation. It was known that these mosquitoes spend the daylight hours resting in or near animal or human habitations. Along each of these creeks a few catching stations were selected. These were hen houses and out-door dry toilets. By visiting each of these stations daily and noting the number of roosting mosquitoes an accurate check of the efficiency of the control measures in the two creeks was obtained.

In Haiti on the other hand where another anopheline is the malarial vector no one has discovered its daylight habitat. Night catches may sometimes be used to advantage. This may be done from an automobile or by using an animal as bait. In either case a flashlight and catching tube are kept handy. Every few minutes the light is turned on and all roosting adults caught.

Larvae eating fish have been used in many places and with, at times, considerable success. In clear pools such as lime sinks, in wells, cisterns, and other containers fish often effectively destroy all larvae.

Ditches and ponds must be cleared of all flottage that may serve as protection for larvae. Where anopheles are being attacked it must be remembered that they are usually found on top of algae masses. Obviously fish cannot get at them unless such débris is removed.

There are many varieties of small fish and in each locality it is usually found that some of the varieties feed near the surface of the water. It is these top minnows that are most efficient.

Of the liquid insecticides pyrethrum infusion is satisfactory for the destruction of adult mosquitoes. They may be killed in a room by closing it tightly and burning pyrethrum powder.

*Flies.*—The house fly is the most common and abundant fly in and about homes throughout the world and is distributed from the sub-polar regions to and through the tropics.

The house fly is mouse grey in general color, with a grey thorax, marked by four equally broad, dark, longitudinal stripes. The

wings are yellowish at the base with distinctive venation. The fourth longitudinal vein is sharply bent upward so as to nearly meet the vein in front.

*Life History.*—The house fly undergoes a complete metamorphosis. Mating takes place in from 2 to 12 days after the adults emerge. Oviposition may begin within 2 to 3 days after copulation. The female deposits its eggs singly, laying from 150 to 200 eggs at a time. Each female lays several batches, four or more during her lifetime, that is from 400 to 600 eggs. The favorite breeding ground is horse manure though eggs may be deposited on any animal excreta or on practically any decaying or fermenting organic material.

The egg which is white and oval in shape hatches in from 12 to 24 hours (at temperatures of from 68° to 80° F). The larva develops very rapidly when food supply and temperatures are favorable. There are three larval stages or instars. The last stage is reached in from 4 to 8 days. When the larva is mature it ceases feeding and proceeds to contract. The anterior end is drawn in and within a few hours a cylindrical case, the puparium, is formed. At first the puparium is creamy yellow in color but soon changes to a rich, dark brown. The pupal period occupies from 4 to 5 days though it may be shortened by high temperatures or prolonged by cool weather.

The entire life cycle from the deposition of the eggs to the emergence of the adult fly varies widely, due to temperature, food, and other factors. Normally it requires from 8 to 20 days. In the warm summer months the average time is from 10 to 16 days.

The house fly is, above all things, a lover of human and animal habitations. The identification of all flies captured in households shows that about 90 percent of them consist of the house fly. Its principal foods are liquids, and any substance however vile if it is moist or can be dissolved will serve as food. On dry substances the fly dissolves it first by secretions from the lingual salivary glands and frequently by regurgitating a part of the liquid present in the crop. Through this habit pathogenic organisms may be deposited on food-stuffs. In addition, contamination may result from material which has adhered to the body or legs.

The house fly is a vigorous flyer and can travel considerable distances. Bishopp and Laake in an extensive series of experiments showed that flies may travel as far as 8 miles. They also showed that flies may travel across wind or even against the wind. They concluded that moderate winds do not influence the direction of flight.

The control of flies and fly breeding may be most successfully accomplished by elimination of breeding places. It is much easier to destroy larvae than to destroy adult flies. Human excreta while not so favored a breeding place as horse manure will nevertheless



serve as excellent material unless properly disposed of. A water-borne sewage disposal system is of course the desirable method of removal. Where this is not available fly-proof toilets should be insisted upon. Garbage should be frequently collected in water tight cans and disposed of by burning. The sale of garbage for hog feed should not be permitted unless there is assurance that a fly breeding nuisance for the station will not result.

Animal excreta of all kinds must be regularly disposed of in such a way as to prevent fly breeding.

As horse manure is the principal and favorite breeding place for house flies its disposal will be considered in detail. If not required for fertilizer it should always be burned when possible. If fairly dry and especially when mixed with hay or straw it can be burned without difficulty.

If it is too wet to burn or if it is required for fertilizer, piling or composting may be done. There are several ways of doing so, one of the best being that devised at the farm of the Government Hospital for the Insane (St. Elizabeths). A rectangular plot of ground of any desired size is marked out and a shallow ditch dug around it. The manure is piled and tightly packed on this ground. In the ditch is poured crude oil to the depth of an inch. It has been found that mature larvae leave manure and enter the surrounding ground before becoming pupae. With this method the larvae in the center of the pile are killed by the heat of the fermenting manure and those leaving the edges fall or crawl into the oiled ditch and are killed. After the manure has been thoroughly rotted it can then be used for fertilizer or if not needed for this purpose may be gotten rid of by burning. This method is one of the simplest and most effective ways of disposal known.

The knowledge that fly larvae can be drowned has been utilized in several ways. A shallow concrete tank full of water with an overlying slat floor on which manure is piled makes a good larval trap. Material containing larvae may be submerged and larvae destroyed. In Haiti and other places where refuse is used to fill in swamps along the shore the dumping of manure and other organic material in wet places has effectually prevented fly breeding.

Infrequently it may be necessary to treat manure with chemicals to control fly breeding. These are not recommended unless other methods of disposal are not possible.

Unless great care is exercised fly breeding will occur in stables. Where the stall floors are of dirt, holes are made by the horses' feet and in these, manure will collect. A good plan is to mix oil with dirt and at regular intervals level all stall floors with this mixture. A satisfactory fly proof material for stall floors has been devised by an

Army officer and consists of 2 by 4's soaked in hot Tarvia. These are laid on edge and are not only easy to clean but also give a springy floor that does not injure the horses feet. Horses cannot be kept on cement floors for any length of time. For destruction of adult flies traps and poisons are used. A good trap is described in Farmers' Bulletin No. 734, United States Department of Agriculture.

The toxic ingredient of most insecticides, liquid or dry, is pyrethrum. A very satisfactory liquid insecticide can be made by adding 1 pound of half open pyrethrum blossoms to a gallon of kerosene. Macerate the blossoms in the kerosene and allow to stand for 48 hours. Filter and use.

For keeping flies and other insects out of barracks and quarters, screening is frequently necessary. Metal screen cloth 16-18 meshes to the inch is best to use because small insects as gnats and some of the smaller mosquitoes can get through the 12-14 mesh screening.

*Fleas.*—Fleas are all, in the adult stage, ectoparasites of warm-blooded animals—mammals and birds. They live among the hairs and feathers and in the nests of their hosts. Fleas visit their hosts primarily for food, both males and females being blood-suckers. The larval life is spent in the nests, burrows, or other habitats of their hosts. Fleas, unlike many parasites, may pass from host to host with considerable indifference. Cat and dog fleas readily attack man and the rat fleas will readily pass to other animals and to man in the absence of their own hosts.

*Life history.*—The eggs are ovoid in shape and white or creamy white in color. They are deposited either in the nest or burrow of the host or laid on the host while the females are feeding. They are not glued to the host but are laid among the hairs or feathers whence they fall off, most commonly in the sleeping places or in the haunts most frequented by their hosts.

The eggs hatch, depending on moisture and temperature, in from 2 to 12 days. The young larvae are minute, active, elongated, legless, and eyeless creatures. Development of the larvae is very rapid and may be complete in a week. When mature the larvae spin silken cocoons within which pupation occurs. The pupal period varies widely from a few days to nearly a year, depending on a variety of circumstances.

*Breeding places.*—Fleas breed in a variety of places when the conditions of moisture and temperature are right and food is available. In houses they are found in the cracks and crevices of the flooring, and very frequently in the dust and debris in cellars. In fact they may be found anywhere that their hosts go. Not infrequently lawns may become infested.

The adults are only periodic parasites on their hosts. Coming to them primarily for food they feed frequently and pass freely from host to host. Fleas are comparatively long lived. In a series of experiments Bocat (1914) found the maximum length of life of the human flea to be 125 days when unfed and 513 days when fed. The Indian rat flea (the plague carrier) had a shorter life-span, only living 38 days when unfed and 100 days when fed.

*Control of fleas.*—The problem of flea control involves a number of distinct measures. These may be roughly classified as (1) control of fleas on domestic pets and in the home; (2) control of fleas on poultry and other domestic animals and in their living quarters; (3) control of fleas on rats and other wild rodents that are sources of plague; and (4) prevention of the spread of plague by controlling the movements of infected rats and their fleas.

In private homes and public buildings flea infestation must be gotten rid of by strict cleanliness. Particular attention should be paid to dirty rugs, closets, hallways, and cellars. To rid a home of fleas the first procedure is the destruction of fleas on the dogs and cats. This may be done with insecticidal powders or by dipping. One gram of powdered derris root mixed with 2 grams of flour or cornstarch will, when dusted on a dog or cat destroy all the fleas. Pyrethrum powder may be used in the same way.

For dipping, a saponified coal-tar creosote preparation known as "stock-dip" may be used. This is mixed according to directions on the package and the animal immersed in it for about 10 minutes. In the case of cats the solution should be washed out of the fur soon after the animal is taken out of it. Another satisfactory "dip" can be made with kerosene and soap. Dissolve 2 ounces of washing soap in 1 quart of hot water. Bring to a boil, remove from the fire, and add 2½ pints of kerosene. Stir vigorously until a milky emulsion is made. Add this to 5 gallons of water.

For the destruction of adult fleas in an infested area, whether in a basement, chicken house, barn, or feed lot, spraying with creosote oil is very effective. This cannot be used for infested lawns as it will kill the grass. Kerosene emulsions or pyrethrum infusions are better for this purpose.

*For destroying fleas in houses.*—Scatter 5 pounds of flake naphthalene over the floor of an infested room and close the doors and windows tightly for 24 hours.

The control of fleas on rats and other wild rodents is accomplished through destruction of the rodents.

*Lice.*—Lice found on persons are of two varieties, namely, the head and body lice, and crab lice. Head lice lay their eggs in the hair of the host cementing them to the hair. Body lice are practically identical with head lice except that they are slightly larger and lay their

eggs on clothing. Crab lice usually frequent the pubic region but may be found anywhere on the body. They cement their eggs to the hair as do the head lice. Removal of head lice may be accomplished in several ways, one of the simplest being to apply equal parts of kerosene and olive oil to the head, wrap in a towel and allow to remain over night. In the morning wash with warm water and soap and then use vinegar or 10 percent acetic acid to loosen the nits. Combing with a fine-tooth comb will remove all dead lice and nits.

For removal of crab lice dilute mercurial ointment or tincture of larkspur may be used. Where large numbers of men are to be treated an effective method is the spraying of the infested regions with 95 percent alcohol or gasoline.

Body lice are killed by heat applied in a variety of ways. Description of the different types of sterilizers are available in many places and will not be given here.

*Bedbugs.*—Bedbugs are primarily parasites of man though occasionally they feed on fowls. They are nocturnal feeders and during the day hide in any convenient place in sleeping rooms. Each female is capable of laying from 75 to about 200 eggs. The adults live a long time and can withstand starvation for a year or perhaps longer.

The eggs hatch in about 10 days. The first stage, the nymph, closely resembles the adult except in size. It probably takes about a month for development from the egg to the adult.

*Control of bedbugs.*—Bedbugs are difficult to eliminate unless proper persistent measures are taken. It does not suffice to destroy those in the bedding. All cracks in the walls, spaces behind bunks, and holes in the bed frames must be well treated.

A simple and efficient mixture is that of turpentine and kerosene. Mattresses and pillows usually require sterilization.

Fumigation is the quickest and most effective method of destroying bedbugs.

If sulphur is used, 4 pounds for each 1,000 cubic feet of space is required.

Hydrocyanic acid gas in the form of Zyklon-Discoïds is the fumigant used by the United States Public Health Service.

Carboxide offers interesting possibilities and may prove to be the safest and best fumigant for general use.

*Roaches.*—There are many genera and species of roaches and their distribution is world-wide. They develop by incomplete metamorphosis, the eggs being retained in a hard case within the abdomen of the female until the larval forms are ready to emerge. Sometimes the eggs may be laid in crevices of walls or floors. The larvae are similar to the adults except that they are smaller. The domestic roach will eat almost anything including leather and books.

**Control.**—The first step in their control is cleanliness. All food should be stored in tight containers and care taken to see that no particles of food are left within access.

Sodium fluoride is a very satisfactory poison and should be spread on shelves, along the edge of pantry floors, and blown into cracks. Better results are obtained if the powder is left in such places for extended periods.

A liquid insecticide such as pyrethrum infusion is useful for spraying into cracks and crevices where it is difficult to introduce powder.

#### REFERENCES

**Medical Entomology**—Matheson.

**Dispersion of flies by flight**—Bishopp, F. C., and Laake, E. W. *Jour. of Agricultural Research* 21, 729-766, 1921.

**Farmers Bulletins**, nos. 1408, 734, 897, U.S. Department of Agriculture.

**The Prevention of Malaria in the Federated Malay States**—Watson.

**Military Preventive Medicine** (Second edition)—Dunham.

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#### REPORT ON TRAFFIC INJURIES, DESTROYERS, BATTLE FORCE, FOR THE FISCAL YEAR 1933

W. L. MANN, Captain, Medical Corps, United States Navy

This report continues an analytical study of traffic injuries among the personnel of the Destroyers, Battle Force, begun in the fiscal year 1932.<sup>1</sup>

Brief abstracts have appeared in the Bureau of Navigation Bulletin (no. 203) and also in the Military Surgeon. The report is too long to reproduce completely but the main features are outlined here.

The noneffectiveness caused by motor-vehicle accidents, is shown by the number of sick days reported in the Annual Reports of the Surgeon General, United States Navy, in injury table A, as follows:

1924 -----	19, 972	1929 -----	32, 585
1925 -----	22, 766	1930 -----	42, 512
1926 -----	25, 171	1931 -----	44, 538
1927 -----	24, 348	1932 -----	42, 456
1928 -----	26, 842		

The real significance of this noneffectiveness and its serious effect on naval efficiency can perhaps be better appreciated by stating that the number of sick days charged to this hazard in 1932 represents the loss of the services of 1,000 men for slightly more than 6 weeks each.

The dangerous age for drivers appears to be between 20 and 35, largely due, it is believed, to youthful irresponsibility and the ease

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<sup>1</sup> See U.S. NAVAL MEDICAL BULLETIN for April 1933, vol. XXXI, no. 2.

with which used cars (often mechanically unsafe) can be purchased. These conclusions are confirmed to a marked degree by a combination of figures appearing in a table in the report whereby it is shown that in a group of 2,231 above the rating of petty officer, second class, of which 1,573 were owners, but 17 injuries occurred, while in a group of 4,090 below the rating of petty officer, first class, with only 583 being owners, 69 were injured. Not only do these figures tend to substantiate the conclusion as to the dangerous driving age, but they also bring out most strikingly the element of ownership as an important factor in the traffic injury problem, in that in the approximately 92 percent larger group and with an ownership about 63 percent less, there were more than four times as many admissions. Overcrowding, using rented and borrowed cars, and driving mechanically unsafe cars undoubtedly were involved in many of the accidents reported, and certainly cannot be considered as evidence of responsibility, regardless of the age of the driver.

The measures which produced such generally satisfactory results, particularly in the reduction of fatalities and severe injuries, in a force having its home port in a city reported as having the highest automobile accident rate among the 86 largest cities of the United States, were both instructional and disciplinary. Informing his command that the acts involved in "reckless driving" and "driving while drunk" were considered to be "conduct to the prejudice of good order and discipline (carelessly or negligently endangering the lives of others)" with the additional naval offense of "drunkenness" present in "driving while drunk", the Commander, Destroyers, Battle Force, directed that "in every case of either offense sustained by proper evidence," the man concerned be subjected to one of the following disciplinary measures:

"(a) Trial by courtmartial or deck court.

"(b) Punishment by commanding officer at mast, and if the latter action was considered sufficient that 60 days' restriction to the ship be the punishment awarded, as an inhibitory warning to other personnel, and to remove, temporarily at least, from the highways a menace to the public safety."

The use of instructional measures was reflected in "a decrease in injuries occurring in the older age group", it being reported that "admonitions and advice from superiors were more effective with the older men while the younger men apparently paid less attention to the various instructions issued."

Concerning the locations and types of disabilities the report states:

It is most interesting to note that there has been a striking decrease in the number of severe injuries—fractures, intracranial injuries, and multiple injuries, extreme.

On the other hand there has been a noticeable increase in the number of minor injuries—contusions and lacerations. As previously mentioned, this is presumably due to the greater zeal of the Medical Departments in 1933 to admit all traffic injuries to the sick list irrespective of the degree of incapacitation.

This contention is supported by the fact that the national figures show a progressive increase in the severity of automobile traffic injuries, while our 1933 injuries were the reverse.

One would naturally expect, as is the case, that the progressively higher speed of each new model of automobile renders the faster type of machine a potential agent to inflict graver disabilities.

The national statistics for 1931 show that the fatalities increased 3.3 percent, and serious injuries increased 4.5 percent, despite a reduction in the total number of persons injured.

In 1930 a death occurred for every 30 persons injured and in 1931 there was a fatality for every 29 persons injured in the United States.

Our experience in 1932 shows one death to every 5.7 men injured, and in 1933, one death to every 42 men injured; a remarkable difference for the 2 years and quite a variation from the national statistics.

The summary of the report also includes comparative figures and attention should be given to the statement regarding avoidability:

Traffic accidents resulted in—	1932	1933
Admissions to the sick list.....	89	86
Men killed .....	13	2
Invalided from service.....	5	3
Men hospitalized.....	65	70

Such accidents represent approximately \$220,792, loss to the Government in 1932 and \$75,668 in 1933.

The officers and higher ratings were strikingly less predisposed to traffic accidents.

The vast majority of accidents may be classed as *avoidable* as indicated by the fact that nearly 500 officers drove automobiles for a year without an injury, except to one Lieutenant who was injured while a pedestrian.

Youth was a most important contributory factor.

The 1933 admission rate was reduced 18 to 50 percent of that for 1932, depending on interpretation of the figures.

Other gratifying results, attributed to the campaign against reckless driving, are shown below:

	1932	1933
Deaths (per 100,000).....	221	32
Invalided (I.S.) (per 100,000).....	85	47
Severe injuries (per 100,000).....	506	937

#### AN OUTBREAK OF FOOD POISONING CAUSED BY VEAL AT THE NAVAL AIR STATION, SAN DIEGO, CALIF.

An outbreak of food poisoning which occurred at the Naval Air Station, San Diego, Calif., August 14, 1933, was reported in detail by Lt. Comdr. E. E. Smith, Medical Corps, United States Navy. The following is an abstract of this report:

Epidemiological study showed that all foods could be dismissed from consideration as a possible cause of poisoning except veal and veal gravy served

at the noon meal on August 13, 1933. Between August 14 and August 17, 183 patients were admitted to the sick list with symptoms typical of food poisoning of *B. enteriditis* type.

Approximately 941 men ate the noon meal on August 13, 183 of whom developed symptoms of poisoning. First symptoms developed 16 hours after the veal steak was eaten.

At morning sick call on August 14, 4 men were considered sufficiently ill to be placed on the sick list and in the following 24-, 48-, and 72-hour periods, 130, 39, and 10 men, respectively, were admitted.

In nearly all of the cases the first indication of illness was headache and diarrhea. Nausea and vomiting were present in about half of the cases. Headache was described as frontal or occipital, and throbbing. Severe cramps accompanied the diarrhea in some cases, lasting from 24 to 48 hours. Stools varied in number, were of offensive odor at onset, and later watery with some mucus. Severe cases complained of weakness, muscular twitching, and restlessness. Herpes was noted frequently. On admission the temperature varied from 99° to 101° and within 12 hours reached an average maximum of 102° to 103°. It rarely exceeded 103°. In a few cases it was subnormal on admission, being associated with symptoms of shock, but it was invariably elevated later in these cases. Fever persisted approximately 48 hours.

The steak in question was delivered August 10 as frozen burlap covered halves. Some of it was served at noon August 12 as fricassee and nine men from the galley and bake shop ate broiled steaks at noon August 11. None became ill. None of the cooked meat which was served at dinner on August 13 was available for examination the following day. Two hindquarters of this consignment remained uncut in the refrigerator. Sterile moist swabs were taken from the surface and cut sections taken from the fat and muscle of each and submitted to the naval hospital laboratory for examination. *B. coli* was obtained from both the swab and meat culture of one of these quarters.

Of the four patients transferred to the naval hospital an organism of the *B. enteriditis* group was isolated from the stool of one case, but subsequent cultures from this same case were negative. These patients were tested for agglutinins for *B. enteriditis* and all were negative.

The only common etiological factor in all cases, with one apparent exception, was that they ate the veal or veal gravy. The meat was thoroughly cooked on the griddle which may account for the negative cultures. The symptoms were typical of poisoning by the *B. enteriditis* group rather than by the cocci, or by some chemical, and do not suggest botulism. Contamination of a portion of the meat, probably fecal and prior to receipt, would seem to have been the cause of this epidemic.

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#### HEALTH OF THE NAVY

The general admission rate, based on returns for diseases, injuries, and poisonings occurring in July, August, and September, 1933, was 476 per 1,000 per annum as compared with 604, the rate for the corresponding quarter of 1932 and 530, the median for this quarter for the preceding 5 years. The rates for the first and second quarters of 1933 were 354 and 470 respectively.

The admission rate for disease was 404 per 1,000, or 20 percent less than the corresponding median (505) for the preceding 5 years.



A slight increase was noted in admissions for injuries for the entire Navy when compared with the second quarter. This increase was due to an increase in injuries to personnel within command but not associated with work.

Poisonings increased from 1.51 per 1,000 per annum for the second quarter of 1933 to 7.10 per 1,000 for July, August, and September, due to an outbreak of food poisoning at the Naval Air Station, San Diego, Calif., in August. An abstract of the report of this outbreak appears on p. 249 of this BULLETIN.

Acute infections of the respiratory type were less prevalent than has been the experience for the past 5 years. A total of 340 of these diseases were reported by all shore stations in the United States during the quarter, of which 61 were notified by the Naval Training Station, San Diego, Calif., 52 by the Marine Barracks, Quantico, Va., 27 by the Marine Corps Base, San Diego, Calif., 23 by the Naval Training Station, Norfolk, Va., and 20 by the Naval Air Station, Sunnyvale, Calif. Acute catarrhal fever constituted 77 percent of these admissions. Only five cases of influenza were reported from all shore stations in the United States during the quarter.

There were 200 admissions for respiratory diseases reported by foreign shore stations, 74 of which occurred in the Fourth Marines, Shanghai, China.

Reports from forces afloat indicate that the morbidity rate for all causes assumed a normal expectancy during July, August, and September, 1933. The admission rate was 481 per 1,000 per annum and the 5-year median for the corresponding 3 months was 498. Twelve ships reported 417 cases of acute catarrhal fever during the quarter. The U.S.S. *New York* reported 25 cases of acute tonsillitis; the U.S.S. *Canopus*, 1 case of scarlet fever; and the U.S.S. *Pennsylvania*, 2 cases of chickenpox and 1 case of scarlet fever. The U.S.S. *Sacramento* reported 1 fatal case of poliomyelitis, anterior, acute, in August.

A case of malaria, benign tertian, was admitted to the sick list on July 13 on board the U.S.S. *Fulton* and the patient was transferred to the Royal Naval Hospital, Hong Kong, China, on July 17 when it was found that he did not respond satisfactorily to quinine therapy. Reports from the laboratory of the Royal Naval Hospital confirmed the diagnosis of malaria, benign tertian, but further laboratory reports on July 20 showed that the patient also suffered with typhoid fever. He became rapidly worse and died on July 22. Health record indicates that he received three injections of typhoid prophylaxis 13 months prior to infection.

TABLE 1.—Summary of morbidity in the United States Navy for the quarter ended Sept. 30, 1933

Average strength	Forces afloat, 71,453		Forces ashore, 34,404		Entire Navy, 105,857	
	Admis- sions	Rate per 1,000	Admis- sions	Rate per 1,000	Admis- sions	Rate per 1,000
All causes.....	8,585	480.60	4,022	467.62	12,607	476.38
Disease only.....	7,402	414.37	3,289	382.40	10,691	403.98
Injuries.....	1,088	60.91	640	74.41	1,728	65.30
Poisonings.....	95	5.32	93	10.81	188	7.10
Communicable diseases, exclusive of venereal diseases:						
A.....	176	9.85	63	7.32	239	9.03
B.....	1,698	95.06	566	65.81	2,264	85.55
Venereal diseases.....	2,436	136.37	618	71.85	3,054	115.40

TABLE 2.—Deaths reported, entire Navy, during the quarter ended Sept. 30, 1933

Cause—Disease		Navy			Marine Corps		Nurse Corps	Total
Primary	Secondary or contributory	Offi- cers	Mid- ship- men	Men	Offi- cers	Men		
Average strength.....		9,376	1,680	78,077	1,176	15,160	388	105,857
Abscess:								
Kidney.....	Pneumonia, broncho.....			1				1
Lung.....	Hemorrhage, lung.....			1				1
Angina, Ludwig's.....	None.....	1						1
Appendicitis, acute.....	Peritonitis, general, acute.....			1				1
Anemia, pernicious.....	None.....			1				1
Calculus, kidney.....	Septicemia.....			1				1
Carcinoma:								
Lung.....	None.....			1				1
Rectum.....	None.....			1				1
General.....	None.....	1						1
Diabetes, mellitus.....	Arteriosclerosis.....	1						1
Glioma, brain.....	None.....			1				1
Heat exhaustion.....	Dilatation, cardiac, acute.....			1				1
Hemorrhage, cerebral.....	None.....					1		1
Myocarditis, chronic.....	Septicemia.....			1				1
Nephritis, chronic.....	Pneumonia, broncho.....			1				1
Osteomyelitis, radius.....	Embolism, coronary.....			1				1
Pneumonia, broncho.....	Dilatation, cardiac, acute.....					1		1
Pneumonia, lobar.....	Septicemia.....			1				1
Poliomyelitis, anterior, acute.....	None.....			1				1
Sarcoma, tibia.....	Sarcoma, lungs, diaphragm, and inguinal glands.....			1				1
Septicemia.....	None.....	1						1
Septic sore throat.....	Pneumonia, broncho.....			1				1
Syphilis.....	Poisoning, neoarsphenamine, acute.....			1				1
Thrombosis, coronary artery.....	None.....					1		1
Tonsillitis, acute.....	Septicemia.....			1				1
Tuberculosis, pulmonary, chronic.....	None.....			1				1
Do.....	Hemorrhage, lung.....					1		1
Do.....	Tuberculosis, miliary, kidney.....					1		1
Do.....	Pleurisy, suppurative.....	1						1
Do.....	Tuberculous enteritis.....			1				1
Do.....	Purpura hemorrhagica.....			1				1
Tuberculosis, brain and meninges.....	None.....			1				1
Typhoid fever.....	Malaria, benign tertian.....					1		1
Total for diseases.....		5	0	22	0	6	0	33

TABLE 2.—Deaths reported, entire Navy, during the quarter ended Sept. 30, 1933—Continued

Cause—Disease		Navy			Marine Corps		Nurse Corps	Total
Primary	Secondary or contributory	Officers	Midshipmen	Men	Officers	Men		
INJURIES AND POISONINGS								
Burn, multiple.....	None.....					1		1
Drowning.....	None.....			8		2		10
Crush, chest.....	None.....					1		1
Fracture:								
Compound, skull.....	None.....			4		2		6
Do.....	Meningitis, cerebral, acute.....					1		1
Simple, skull.....	None.....					1		1
Do.....	Hemorrhage, intracranial.....			4		1		5
Do.....	Hemorrhage, subdural.....			1				1
Do.....	Intracranial injury.....	1		1				2
Vertebra, cervical.....	Intraspinal injury.....			1				1
Injuries, multiple, extreme.	None.....	2		9		3		14
Rupture, traumatic, heart, lungs, liver, and spleen.	None.....			1				1
Rupture, traumatic, spleen.	None.....			1				1
Wound:								
Gunshot, abdomen.....	Hemorrhage, iliac.....			1				1
Gunshot, head.....	None.....					3		3
Lacerated, aorta.....	None.....			1				1
Lacerated, neck.....	Hemorrhage, traumatic, jugular vein.	1						1
Punctured, heart.....	None.....			1				1
Punctured, innominate and aorta.	Hemorrhage, intrathoracic.....			1				1
Total for injuries and poisonings.....		4		34		15		53
Grand total.....		9		56		21		86
Annual death rate per 1,000:								
All causes.....		3.84		2.87		5.52		3.25
Disease only.....		2.13		1.13		1.58		1.25
Drowning.....				.41		.53		.38
Other injuries.....		1.71		1.33		3.42		1.62

**ADMISSIONS FOR INJURIES AND POISONINGS, THIRD QUARTER, 1933**

The following table, indicating the frequency of occurrence of accidental injuries and poisoning in the Navy during the third quarter, 1933, is based upon all Form F cards covering admission in those months which have reached the Bureau.

	Admissions, July, August, and September, 1933	Admission rate per 100,000, per annum	Admission rate per 100,000, year, 1932
<b>INJURIES</b>			
Connected with work or drill	637	2,407	2,440
Occurring within command but not associated with work	525	1,984	1,675
Incurred on leave or liberty or while absent without leave	566	2,139	1,900
All injuries	1,728	6,530	6,015
<b>POISONINGS</b>			
Industrial poisoning	10	38	8
Occurring within command but not connected with work	174	657	68
Associated with leave, liberty, or absence without leave	4	15	17
Poisonings, all forms	188	710	93
Total injuries and poisonings	1,916	7,240	6,108

*Percentage relationship*

	Occurring within command				Occurring outside command—Leave, liberty, or a.w.o.l.	
	Connected with the performance of work, drill, etc.		Not connected with work or prescribed duty			
	July, August, and September 1933	Year, 1932	July, August, and September 1933	Year, 1932	July, August, and September 1933	Year, 1932
Percent of all injuries.....	36.9	40.6	30.4	27.8	32.7	31.6
Percent of poisonings.....	5.3	8.7	92.6	72.8	2.1	18.5
Percent of total admissions, injury and poisoning titles.	33.8	40.1	36.5	28.5	29.7	31.4

NOTE.—Poisoning by a narcotic drug or by ethyl alcohol is recorded under the title "Drug addiction" or "Alcoholism", as the case may be. Such cases are not included in the above figures.

There were no cases during the third quarter of 1933 worthy of notice from the standpoint of accident prevention.

#### STATISTICS RELATIVE TO MENTAL AND PHYSICAL QUALIFICATIONS OF RECRUITS

The following statistics were taken from monthly reports submitted by Boards of Medical Survey at naval training stations:

July, August, and September, 1933	United States naval training station	
	Hampton Roads, Va.	San Diego, Calif.
Recruits received during the period.....	0	1,399
Recruits appearing before Board of Medical Survey.....	0	1
Recruits recommended for discharge from the service.....	0	1
Recruits discharged by reason of Medical Survey.....	2	1
Recruits held over pending further observation.....	0	0
Recruits transferred to the hospital for treatment, operation, or further observation for conditions existing prior to enlistment.....	1	34

The following table was prepared from reports of medical surveys in which disabilities or disease causing the surveys were noted as existing prior to enlistment. The time which elapsed from date of enlistment to date of medical survey is noted in each case. With certain diseases, survey followed enlistment so rapidly that it would seem that many might have been eliminated in the recruiting office. The difficulty in establishing a diagnosis in nervous and mental cases is demonstrated by the time interval in the table. An exception in this group is epilepsy, which may or may not be diagnosed promptly. Certain groups, of course, present difficulties in diagnosis at the time of enlistment due to lack of equipment.

Cause of Survey		<i>Number of days between enlistment and survey</i>
Absence, acquired, teeth	-----	16
Do	-----	11
Alcoholism, chronic	-----	8
Astigmatism	-----	35
Do	-----	11
Caries, teeth	-----	11
Color blindness	-----	109
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VOL. XXXII

JULY 1934

No. 3

# UNITED STATES NAVAL MEDICAL BULLETIN

PUBLISHED QUARTERLY FOR THE INFORMATION OF  
THE MEDICAL DEPARTMENT OF THE NAVY



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THE BUREAU OF MEDICINE AND SURGERY  
NAVY DEPARTMENT



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NAVY DEPARTMENT,  
*Washington, March 20, 1907.*

This UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the Department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,  
*Acting Secretary.*

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Owing to the exhaustion of certain numbers of the BULLETIN and the frequent demands from libraries, etc., for copies to complete their files, the return of any of the following issues will be greatly appreciated.

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## PREFACE

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THE UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April 1907 as a means for supplying medical officers of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine, descriptions of suggested devices, clinical notes on interesting cases, editorial comment on current medical literature of special professional interest to the naval medical officer, and reports from various sources, notes, and comments on topics of medical interest.

The Bureau extends an invitation to all medical and dental officers to prepare and forward, with a view to publication, contributions on subjects of interest to naval medical officers.

In order that each service contributor may receive due credit for his efforts in preparing matter for the BULLETIN of distinct originality and special merit, the Surgeon General of the Navy will send a letter of commendation to authors of papers of outstanding merit.

The Bureau does not necessarily undertake to endorse all views or opinions which may be expressed in the pages of this publication.

P. S. ROSSITER,

*Surgeon General, United States Navy.*

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## NOTICE TO SERVICE CONTRIBUTORS

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Contributions to the BULLETIN should be typewritten, *double spaced*, on plain paper, and should have wide margins. Fasteners which will not tear the paper when removed should be used. Nothing should be written in the manuscript which is not intended for publication. For example, addresses, dates, etc., not a part of the article, require deletion by the editor. The BULLETIN endeavors to follow a uniform style in heading and captions, and the editor can be spared much time and trouble, and unnecessary changes in manuscript can be obviated, if authors will follow in these particulars the practice of recent issues.

The greatest accuracy and fullness should be employed in all citations, as it has sometimes been necessary to decline articles otherwise desirable because it was impossible for the editor to understand or verify references, quotations, etc. The frequency of gross errors in orthography in many contributions is conclusive evidence that authors often fail to read over their manuscripts after they have been typewritten.

Contributions must be received 3 months prior to the date of the issue for which they are intended.

The editor is not responsible for the safe return of manuscripts and pictures. All materials supplied for illustrations, if not original, should be accompanied by reference to the source and a statement as to whether or not reproduction has been authorized.

The BULLETIN intends to print *only original articles, translations, in whole or in part, reviews, and reports and notices of Government or departmental activities, official announcements, etc.* All original contributions are accepted on the assumption that they have not appeared previously and are not to be reprinted elsewhere without an understanding to that effect.

# U.S. NAVAL MEDICAL BULLETIN

VOL. XXXII

JULY 1934

No. 3

## SPECIAL ARTICLES

### PEACE TIME ACTIVITIES OF THE MEDICAL DEPARTMENT OF THE UNITED STATES NAVY<sup>1,2</sup>

By P. S. ROSSITER, Rear Admiral Medical Corps, Surgeon General, United States Navy.

A large majority of even well-informed persons throughout the country have little knowledge of the peace-time activities of the Navy as a whole and less knowledge of the diversified activities of the Medical Department of the Navy. Many who give it any thought probably believe that in time of peace naval medical officers have very little to do and generally become pretty rusty professionally. This is far from true, for even in times of peace the relatively small medical personnel is very actively engaged, not only in sanitary problems, but in professional work comparable to that of a civil practitioner with a very active service. The standards of professional work among them compares favorably with that of any first-class institution or group in the country.

The ships and stations of the Navy are officered and manned by a population equal to that of a city of moderate size. On October 30, 1933, there were 105,934 officers and enlisted men in the Navy, for whose health and medical and surgical care its medical department is responsible. In addition to these are our naval colonies of Guam and Samoa, where civil populations of 15,000 and 8,000, respectively, are directly administered by the Navy and complete medical care furnished by the Naval Medical Department.

Until recently, the Virgin Islands and its population of approximately 25,000 were also included in this category. In Haiti, the Dominican Republic, and Nicaragua, with a combined population approximating 5,000,000, medical officers of the Navy have in whole or in part organized and administered the Public Health Service and taken an important place in the field of preventive medicine in those countries. To deal with this task, the Medical Department of the Navy had on October 30 of this year 673 doctors, 184 dentists, 128 pharmacists, who form the commissioned or warrant branch

<sup>1</sup> Read in general clinical session, Southern Medical Association, twenty-seventh annual meeting, Richmond, Va., Nov. 14-17, 1933.

<sup>2</sup> Printed in Southern Medical Journal, July 1934.

of the personnel; 3,407 Hospital Corps men, who form the enlisted branch of the Medical Department, and 389 female nurses.

At the head of the Medical Department of the Navy is the Surgeon General, who is the Chief of the Bureau of Medicine and Surgery, appointed by the President, in accordance with the Revised Statutes, for a period of 4 years. The Bureau of Medicine and Surgery is 1 of 5 bureaus in the Navy Department established by the act of Aug. 31, 1842, which provides that the several bureaus shall retain the charge and custody of the books of records and accounts pertaining to their respective duties, such duties to be performed under the authority of the Secretary of the Navy, and their orders shall be considered as emanating from him and having full force and effect as such.

#### GENERAL DUTIES OF THE MEDICAL DEPARTMENT

In a general way, the duties of the Bureau of Medicine and Surgery and the Medical Department may be said to consist of safeguarding the health of the Navy. I propose to state, however, a little more in detail some of the duties prescribed by law and laid down in the United States Navy Regulations.

The Bureau of Medicine and Surgery shall have charge of the upkeep and operation of all hospitals and of the force employed there; it shall advise with respect to all questions connected with hygiene and sanitation affecting the service and, to this end, shall have opportunity for necessary inspection; it shall provide for physical examinations; it shall pass upon the competency, from a professional standpoint, of all men in the Hospital Corps for enlistment, enrollment, and promotion by means of examinations conducted under its supervision or under forms prescribed by it; it shall recommend and have information as to the assignment and duties of all enlisted men of the Hospital Corps; it shall recommend to the Bureau of Navigation the complement of medical officers, dental officers, nurses, and Hospital Corps men for hospitals and hospital ships, and shall have power to appoint and remove all nurses in the Nurse Corps, subject to the approval of the Secretary of the Navy.

It shall approve the design of hospital ships insofar as relates to their efficiency for the care of the sick and wounded.

The Bureau of Medicine and Surgery is charged with the duty of inspecting the sanitary condition of the Navy and making recommendations in reference thereto; of advising with the Department and other bureaus in reference with the sanitary features of ships under construction and in commission, regarding berthing, ventilation, location of quarters for the care and treatment of the sick and injured; of the provisions for the care of wounded in battle; and, in the case of shore stations, of advising in regard to health conditions depending on location, the hygienic construction and care of public buildings, especially of barracks and other habitations, such as camps. It shall provide for the care of the sick and wounded, the physical examination of officers and enlisted men, with a view to the selection or retention of those only whose physical condition is such as to maintain or improve the military efficiency of the service if admitted or retained therein, the management and

control of naval hospitals, and of the internal organization and administration of hospital ships, the instruction of personnel of the Hospital Corps and Nurse Corps, and the furnishing of all medical and hospital supplies.

All technical schools which are, or may be, established for the education of medical and dental officers or members of the Hospital Corps and Nurse Corps shall be under the supervision and control of the Bureau of Medicine and Surgery.

This constitutes a large order and one sufficient to keep the medical personnel actively employed. Such is, indeed, the case. The task is made the greater by the widespread distribution of the ships and stations of the Navy. On all ships and stations, however, there are excellent facilities for the care of the sick. At shore stations they are called dispensaries; on board ship, sick bays. Each consists of a drug room, an office and examining room, a small general ward, a contagious ward, an operating room, dental office, and a storeroom. Sometimes there is a quiet room and a small laboratory. The dispensaries and sick bays are intended for emergency treatment and the care of relatively transitory conditions.

The naval medical officer of a ship resembles in many ways a general practitioner in a small town with, however, certain differences. He has only men to deal with, they are carefully selected physically, and, with few exceptions, in the younger age groups. The diseases peculiar to such age groups are those commonly seen by him. The acute infections and communicable diseases, particularly the respiratory infections, are frequent, favored by the relatively crowded conditions of shipboard life and the difficulties of heating and ventilation. One feature of naval life not often mentioned but which probably has effect on the health of personnel is the rapid changes of climate to which they are often subject. Ships passing from the rigors of northern winters to the Tropics and back again in the space of a few days and without opportunity for acclimatization no doubt produce effects little studied or understood, but which may lead to certain pathological conditions.

In surgery, injuries as the result of the hazards of military and naval life and such conditions as acute appendicitis and hernia are common. Some one has said that the specialties of every general practitioner in civil life were obstetrics and internal medicine. The specialties of every naval surgeon are emergency surgery and preventive medicine. An acute appendix may occur when the ship is in the middle of the Pacific and tossing about in a rough sea. There is no way then to turn the case over to a surgical consultant. The medical officer of the ship must be the surgeon. But he must also be a sanitarian, for he is explicitly charged with the responsibility of reporting immediately to his commanding officer in writing upon "becoming aware of any contagious or infectious disease or its ap-

pearance among the crew", and "shall keep himself informed of the sanitary condition of the port in which the ship is lying, and immediately report to the commanding officer any facts that may influence the health of the personnel of the ship." It must be remembered, too, that the medical officer is charged with important military and administrative duties in addition to his professional work; that he is in charge of a department that includes the medical and dental officers, enlisted men of the Hospital Corps, that he inspects the food, makes inspection of "living spaces, holds, and storerooms", attends all drills such as gun drills, man overboard, fire, collision, fire and rescue, and landing forces. On a large battleship with 1,500 officers and men for the population of the town in which he and one other doctor and a dentist share the general practice, he is sufficiently busy. Twenty thousand patients were treated in the sick bay of one such ship, 10,000 prescriptions dispensed, and 4,500 dental treatments given in a year.

#### THE NAVAL HOSPITALS AND THEIR WORK

For more complete medical and surgical treatment, the Navy maintains within the continental limits of the United States 14 naval hospitals, while beyond the continental limits are 3 more. The most important naval hospitals within the continental limits are those at New York; Washington, D.C.; Annapolis, Md., the seat of the United States Naval Academy; Portsmouth, Va.; Mare Island, Calif.; and San Diego, Calif. Beyond the seas are the three important naval hospitals at Pearl Harbor, Territory of Hawaii; Guam, located on the island of that name far in the Pacific; and Canacao, located near Manila in the Philippine Islands.

In addition, the Navy maintains at present 1, and until recently, 2 hospital ships, which are essentially floating hospitals, capable of accompanying the fleet or major groups of the fleet to any part of the world.

In the various hospitals there are about 3,000 to 6,000 patients being cared for daily. Every pathological condition is seen and definitive treatment is given, and these hospitals are as completely equipped with facilities for such treatment as are the large civilian hospitals of the country. The number of surgical operations performed in a recent calendar year was 28,117, excluding instrumental examinations, such as cystoscopy, bronchoscopy, and similar procedures which added 2,980 to the number. It must be remembered that the location and the facilities of these hospitals also are intended to serve the Navy in time of war as well as in time of peace, and their size and location depends more on this special fact than on any other.



The most important single group of diseases in the Navy as respects number of original admissions is the communicable-disease group transmitted by oral and nasal discharges. This group furnishes nearly 30 percent of all original admissions to the sick list. Next to this are the venereal diseases. Third place, as a cause of morbidity, is occupied by wounds and injuries, including many special hazards peculiar to military and naval life. Diseases transmitted by insects and arthropods and representing many important tropical diseases, such as malaria, dengue, and pappataci fever, cause only about 2.5 percent of all admissions for disease.

Smallpox, because of the care in respect to vaccination, is kept at the edge of nonexistence in the Navy, notwithstanding the fact that on some foreign stations, as in Chinese waters, exposure to particularly virulent forms of the disease greatly increases the danger of infection. The Navy represents one of the most highly vaccinated groups in the world and the results with Jenner's discovery continue to indicate its tremendous value. Improved methods of packing to retain the potency of virus while in transit to distant parts of the world and through many climates are needed.

Wounds and injuries provide about 12 percent of all original admissions to the sick list. During the past calendar year, the total number for the Navy was 6,588. Many of these are caused by special nautical hazards, such as operation of aircraft, submarines, handling boats, guns, ammunition, falls from masts, through hatches, falling overboard, and similar accidents. However, though for many years drowning had been the principal cause of death, in recent years that place has been taken by automobile fatalities occurring among men while on leave and liberty. Last year drowning, the form of accidental death usually associated with seagoing life, caused 34 deaths, while automobile fatalities numbered 70. Nearly all were among men on leave and liberty. A few were among drivers of Government-owned vehicles at navy yards or other naval stations ashore.

#### RECRUITING ACTIVITIES

In an average year, medical officers of the Navy at our recruiting stations examine about 75,000 applicants for original enlistment, of whom more than two thirds are rejected as physically unfit. The principal causes of rejection are defective teeth, errors of refraction, flat foot, defective physical development, underweight, color blindness, and diseases of the heart.

#### WORK OF DENTAL DEPARTMENTS

During the calendar year 1932, Navy dental officers treated 446,553 cases covering all types of dental operations and treatments.

## MEDICAL SUPPLIES

To purchase and supply for use in the Medical Department drugs, instruments, hospital appliances, and to maintain stores of these articles for emergency use, 3 naval medical supply depots, 1 at Brooklyn, N.Y.; 1 at Mare Island, Calif.; and 1 at Canacao in the Philippine Islands, are maintained.

## ACTIVITIES OF THE MEDICAL DEPARTMENT IN OUR COLONIAL POSSESSIONS

The Spanish-American War, which resulted in our becoming a world power with many widely scattered colonial possessions, added many duties to the Medical Corps of the Navy which they are still performing. These colonies contain large native populations and it became the responsibility of the United States to see that these people did not suffer from their change of status. Naval medical officers were faced with the problem of dealing with numerous tropical diseases, their prevention and treatment, and the prevention of their introduction into the United States. Large civil populations became wholly or partly dependent for medical treatment upon the Medical Department of the Navy.

## GUAM

This was particularly true of Guam, an island situated in the Pacific Ocean, 1,200 miles east of the Philippines. It was captured by the U.S.S. *Charleston*, then proceeding to Manila to reinforce the fleet of Admiral Dewey. On August 7, 1899, the U.S.S. *Yosemite* arrived in Guam and established a naval station there. Since that time, it has had a naval governor and all the medical work in the islands has been done by naval medical officers, a hospital was built, sewers were laid, and arrangements made for obtaining an abundant supply of pure water. The island had long been devastated by yaws and a form of this disease, gangosa, in which the destruction of the palate gave a peculiar muffled character of the voice. Studies by early medical officers indicated that both yaws and gangosa were due to infection with a treponema, and responded to antiluetic treatment. Prior to this the ravages of these diseases had mutilated thousands. How completely they had been conquered is shown by a report in 1916:

Guam has several hundreds of persons who show the residual effects of old gangosa lesions, but the treatment by salvarsan and mercury has been so successful that active cases are now very rare and a medical officer may serve a tour of duty here without ever seeing the disease in its acute manifestation.

With the building of a hospital and the institution of many important preventive measures was associated the founding of a train-

ing school for native nurses and the training of a large number of native young women in nursing. With these, too, were developed an extensive obstetrical service resulting in a marked reduction in maternal and infant mortality. The establishment of modern measures for the prevention of disease, the conquest of yaws and gangosa, the medical care of the civil and military populations have furnished and continue to furnish a field for active employment. It must be remembered that in this island the entire care of the population is placed upon the Medical Department of the Navy, and that the island is isolated far out in the Pacific.

#### AMERICAN SAMOA

American Samoa consists of a small group of islands in the southern Pacific, which since its acquisition by the United States in 1900 has also been governed by a naval governor and its many problems dealt with by the Medical Department of the Navy. Within 1 year after occupation of Samoa, the entire population had been vaccinated against smallpox. The problem of water supply was less important than in some other place. In the first place, there was no trouble in getting water, for the average rainfall is 65 inches, and instances where it has risen to 300 inches in a year. One medical officer informs me that he saw 36 inches of rain in 48 hours.

The diseases most characteristic of these South Sea Islands are filariasis, yaws, hookworm infections, and elephantiasis. Hundreds of Samoans were crippled by the latter condition, due to the immense size of the edematous swelling, particularly of the scrotum. When sitting, the enormously enlarged scrotum rested on the ground and locomotion was impossible. In 1906, Fauntleroy devised a successful surgical treatment, which was modified by subsequent operations. This seemingly formidable plastic operation is performed with complete success and scrotal masses weighing from 10 to 85 pounds are removed.

#### THE VIRGIN ISLANDS

In 1917, the United States acquired the Danish West Indies, or Virgin Islands, by purchase. These possessions also, until recently, have been under the supervision of a naval governor. Sanitary conditions in these islands, of course, were considerably better than in Guam and Samoa, as the Danish Government had paid great attention to the welfare of this colony. However, both pellagra and typhoid fever were prevalent, and an active campaign resulted in a remarkable improvement in conditions and in a great diminution in the occurrence of both diseases. Although the islands were able to supply an abundance of food, such as eggs, chickens, milk, and fish, it was found that, partly from poverty and partly from disinclina-

tion, the natives lived largely on cornmeal and sugar sirups, with a little salt fish. The virtual eradication of pellagra was obtained by hospitalizing any patient discovered with it and treatment by the addition of the proper foods to the diet. Each cured patient became an emissary who spread the news, and resulted in a solution of the pellagra problem in the island. For 14 years the Medical Department of the Navy was responsible for the sanitary and medical care of the entire population in these islands.

#### HAITI, SAN DOMINGO, NICARAGUA, AND THE PHILIPPINES

The work of the Medical Department in Haiti, San Domingo, Nicaragua, and the Philippines is also extensive. In the first three named a complete extensive public health service made up of medical officers of the Navy, assisted by native medical personnel, has been the starting point for public health activities which have contributed far-reaching benefits to the peoples of these countries and to science. For example, I will cite a few figures to show the extent of this work in Haiti alone. The total number of treatments in dispensaries and rural clinics in Haiti during a recent year was 866,673. The total number of injections for treponematosiis, 550,945. Treatments for malaria numbered 36,853 and for intestinal parasites, 46,024. The total number of miles traversed in rural clinic work by automobile 73,770, by horse 11,610, motorboat 4,992, and by airplane 1,000 miles. Four and one half million units of tetanus antitoxin were given, 24,000 points of cowpox vaccine used, and 1,050 doses of antirabic vaccine given. It is not surprising that with this wealth of material available, naval medical officers have made many important contributions to tropical medicine. At the recently founded Gorgas Memorial Laboratory in Panama the Navy has a medical officer engaged entirely in research in tropical medicine and hygiene.

#### RECORDS FOR PENSION CLAIMS AND STATISTICAL INFORMATION AND VETERANS' BUREAU PATIENTS

Although it is not usually thought of in connection with medical work in the Navy, a tremendous volume of valuable records and statistics regarding the sick and injured are made annually and published or filed. These records are of the greatest importance, and many of them go back to the early days of our Republic. The physical and clinical records supply the authoritative information upon which all pension claims are based. This is of particular importance because from 1919 until almost the present time a vast number of veterans of the World War were cared for in naval hospitals. For example, in the 3 years 1929, 1930, and 1931, more than

100,000 cases coming under the Veterans' Bureau were treated in naval hospitals. The published statistics of disease are eagerly sought by health departments and actuaries throughout the world.

#### POSTGRADUATE TRAINING AND RESEARCH

The Naval Medical School in Washington is maintained as a postgraduate school for training in naval medical subjects particularly, and serves also as a consulting clinical laboratory for the entire Navy. It is a research center for naval medical subjects in such important fields as purification of air in submarines, the medical aspects of devices for escape from a submerged submarine, deep-sea diving, chemical warfare, and such aviation problems as a prevention of carbon monoxide poisoning among aviators, a work in which the Naval Medical Department has been a pioneer. High altitude flying, the maintenance of equilibrium and psychological problems connected with aviation are other important fields of study. There is need for research in the ventilation, lighting, and heating of ships, the prevention of communicable diseases afloat, the control of venereal diseases, and of clothing most suitable for the various activities of the Navy in the varying climates in which they are called upon to perform duty. These and many other diversified problems of naval medicine form an important part of the work of the Naval Medical School, and in the event of a national emergency its function as a training field in these subjects would be of the utmost value.

Each year a postgraduate board makes studies of the specialist needs of the Navy and from time to time recommends to the Surgeon General the training of a certain number of medical officers at civilian institutions in the various specialties which they desire to enter. A small number of medical officers and enlisted men are given additional training at the Medical Field Service School maintained by the Army at Carlisle Barracks, Pa., so that they may be better fitted for duty with marine expeditionary forces. These expeditionary forces may be called upon at any time and with scarcely any warning for the protection of American and other lives and property in cases of disorders occurring in foreign countries. Supplying medical service to these marine expeditions and also to naval landing parties requires both higher specialized knowledge and specialized equipment. Personnel trained for this service must be immediately available at all times.

#### PREPARATION FOR NATIONAL EMERGENCY

It must not be forgotten that one of the Navy's most important tasks in time of peace is to be prepared for war, and that the Navy is intended as a barrier against enemies and, furthermore, that it is the first barrier or, as a popular phrase has it, "the first line of

national defense." Its readiness must be limited to days and hours, trained personnel, facilities for care of sick and injured, and plans for expansion must carefully and laboriously be made ready during times of peace for periods of national emergency which may arise. However, it is not only for war that the Navy must be prepared. Other great emergencies calling for its services frequently arise. In time of peace the Navy often meets emergencies which, in themselves, have many of the characteristics of war. At the earthquake and fire in San Francisco and at Messina, Italy, ships of our Navy at once sent landing forces ashore, accompanied by almost the entire medical department of the vessels present, and rendered valuable assistance. At the earthquake in Japan, which demolished Yokohama, probably the most tremendous disaster of its kind in recorded history, vessels of the United States Navy were quick to speed to the relief of the stricken city. Food, blankets, and medical supplies were landed, thousands of doses of antitetanic serum and typhoid vaccine were given, smallpox vaccinations carried out, as well as many other important sanitary measures, such as restoration of proper water supply, disposition of wastes, and similar activities.

In British Honduras and San Domingo City widespread destruction was caused by a hurricane, and here again naval medical officers gave assistance of the greatest value. Two years ago, the city of Managua in Nicaragua was almost destroyed by earthquake. The naval hospital ship *Relief*, while proceeding north from Panama, at once turned back and proceeded to the nearest Nicaraguan port at full speed, landing medical officers, female nurses, and Hospital Corps men, medical supplies, and equipment. Last spring, an earthquake severely affected Long Beach and adjoining towns in southern California. Fire and rescue parties from the fleet with medical units attached were ashore in less than 30 minutes. So, even in peace time, the Medical Department of the Navy not only has to be ready for war, but to meet emergencies which are, in themselves, of the nature of war.

#### THE PRESIDENT AND THE NAVY

It is gratifying that President Roosevelt, the second of that name to have served as President and Commander in Chief and the second to have served as Assistant Secretary of the Navy, has in consequence so great a knowledge and appreciation of the importance of the Navy. He recently expressed it in his message last Navy Day. I quote in part:

The United States Navy has never failed to render the fullest measure of service to the United States in every war. The men and the ships of the Navy, constituting the first line of defense, have thwarted the hopes and ambitions of the enemy, and in time of peace the Navy has ever been a true emissary of good will.

**THE SECRETARY OF THE NAVY AND THE MEDICAL DEPARTMENT**

We are today particularly fortunate, too, in having as Secretary of the Navy one who is very familiar to you here, for he is a fellow Virginian, Secretary Swanson, long a distinguished Senator from this State and for many years a member of the Naval Affairs Committee; his knowledge of the needs of the Navy and of the Medical Department of the Navy is preeminent. We look with confidence to his maintaining those needs at the highest possible point.

In conclusion, I wish to leave you with a broad, general picture of the Navy as a whole: More than 100,000 officers and men, a city in itself, but with its inhabitants scattered over the wide world in the performance of their duties, serving on ships in every sea and on stations in lands beyond the seas. The Medical Department of the Navy is engaged and busily employed with the tasks of caring for the sick and injured of the Navy afloat and ashore, and occupied, too, with important problems of preventive medicine and the preservation of the health not only of the Navy itself, but of considerable native populations in colonial possessions or friendly neighboring countries. Besides doing these everyday tasks, naval medical officers have contributed much and are still contributing to research in the fields of preventive medicine, tropical medicine, and naval medicine. Such are the peace-time problems of the Medical Department and its peace-time work. This work is often arduous, laborious sometimes to a degree, often done among the hazards of seafaring and military life, but our officers and men are rewarded in some measure by the satisfaction that comes from worthy accomplishments, and the feeling that the country realizes and appreciates their work, at once world-wide and humanitarian in character, spreading everywhere the best traditions of America and of American medicine.

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**A METHOD FOR CULTURING ANAEROBES AND BACTERIA REQUIRING CARBON DIOXIDE TENSION<sup>1</sup>**

By PAUL F. DICKENS, Lieutenant Commander, Medical Corps, United States Navy

During the fall of 1932, the United States Naval Medical School began a series of experiments and investigations as to the cause of serious accidents in the United States Navy incident to personnel entering compartments which had been closed for a long time. The investigation was started with the knowledge that paints drying by oxidation, of a necessity, depleted the oxygen content of the atmosphere provided the compartment was closed prior to the drying of the paint. The air obtained from compartments of ships which had

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<sup>1</sup> Received for publication, Mar. 15, 1934.

been painted with linseed-oil paint and closed for considerable period of time was found to be markedly deficient in oxygen. In the experiments conducted at this school it was found that small containers like Erlenmeyer flasks, in which a small quantity of linseed oil had been placed, depleted the air in the flask of its oxygen content and further investigation determined that if this oil was heated and the flask stoppered before the air had been allowed to cool, the oxygen content could be reduced to as low as 2 percent within a few hours. The oxidation was markedly accelerated by the addition of a catalytic agent (common commercial paint dryer).

Realizing the difficulty the bacteriological department had in culturing anaerobic organisms, especially those requiring a low oxygen tension and also those requiring an increased carbon dioxide tension, we became convinced, that as a by-product of the investigation already started we might have accidentally discovered a simple method which could be used by the department of bacteriology to effectively grow anaerobic bacteria. Continuing our investigation of the deprivation of oxygen in compartments on board ship, we conjointly carried forward experiments to determine the practical application and feasibility of utilizing the findings of our original investigation as applied to bacteriology.

#### EXPERIMENTAL STEPS

A special apparatus was then made at the school as shown in figure 1. Seventy-five cubic centimeters of linseed oil was placed in the specially prepared Erlenmeyer flask and heated to produce a partial vacuum. The flask was then stoppered and set aside at incubator temperature and the air obtained from the small glass tube which had been annealed to the flask to allow an easy method of obtaining air from the flask for analysis. It was found that the air in the flask was reduced in oxygen content to as low as 2.6 percent in 24 hours. Samples of air were obtained by simply breaking the closed end of the tube beneath mercury and drawing into a Van Slyke machine in the usual manner. Having now determined that the air could be definitely deprived of oxygen in the Erlenmeyer flask, a special culture tube was made and these tubes were then inoculated with anaerobic bacteria, sealed as before, connected by rubber tubing to the Erlenmeyer flask, and as soon as a luxuriant growth was obtained a Stewart clamp was closed down tightly, closing the rubber tube, the Erlenmeyer flask containing the oil was detached and the culture handled in the usual way (fig. 1).

After proving the method feasible the next step was to simplify the procedure and to eradicate the necessity of any special apparatus. It was found that an Erlenmeyer flask with a bent glass tube inserted



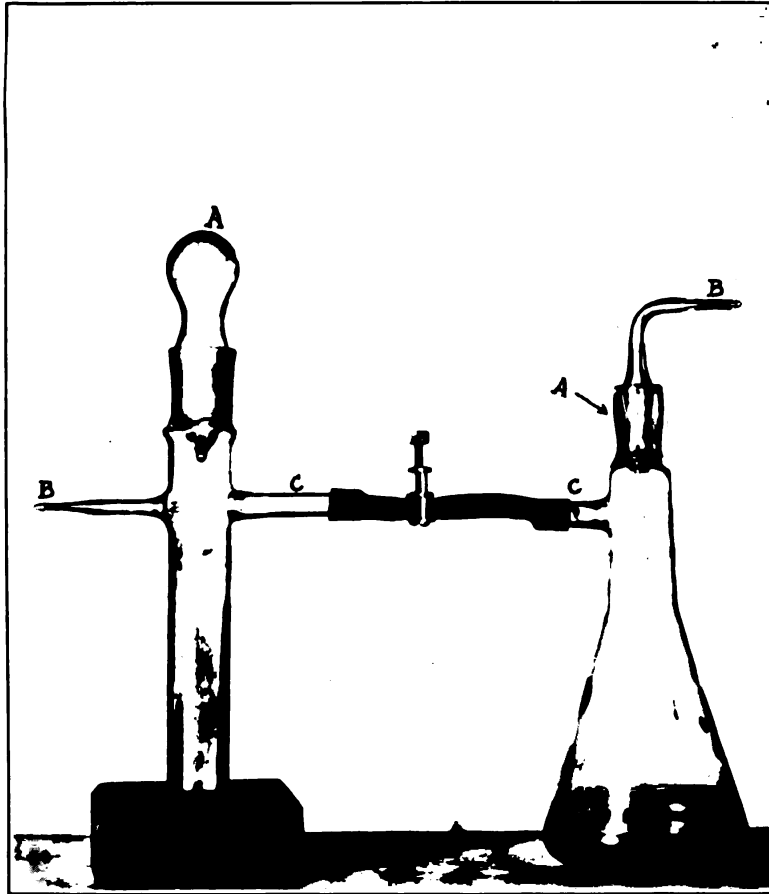


FIGURE 1.

The specially made experimental culture tube and Erlenmeyer flask. The stoppers, marked "A", were ground to fit an especially annealed neck to the culture tube and flask. The sealed glass tubes, marked "B", were then annealed to the tube and flask to facilitate the obtaining of air for analysis. The glass tubes, "C", were annealed to the tube and flask to accommodate the rubber tubing. Note the growth of bacteria in the culture tube.



in a rubber stopper, a culture tube containing media inoculated in the usual manner and stoppered with a sterile rubber stopper containing a sterile piece of bent glass tubing, to which was attached a short length of rubber tubing and Stewart clamp, answered the purpose. (See fig. 5.)

It was found that without the addition of a catalytic agent oxidation took place very slowly. We tried to accelerate the rate of oxidation by the addition of commercial paint dryer (catalytic agent) and found that the oxygen content in both the culture tube and flask could be reduced, as stated above, to as low as 2 percent within a few hours. This proved efficacious for those organisms demanding reduced oxygen only. (See figs. 2 and 5.)

Continuing our investigation it was found it would be necessary to find some simple means of obtaining carbon dioxide for those organisms requiring a reduced oxygen and a high carbon dioxide tension. We decided that it would be best to heat the oil in the Erlenmeyer flask to create a partial vacuum, and then to displace the air above the hot oil with carbon dioxide from a small tank which was obtained from the operating room of the hospital. (See figs. 2, 3, 4, and 5.) With the carbon-dioxide gas escaping into the Erlenmeyer flask, the rubber tube was immediately withdrawn from the flask and the flask stoppered. It was found that this method supplied sufficient carbon dioxide for the growth of those organisms requiring a reduced oxygen and increased carbon-dioxide content. After determining that this procedure was satisfactory the following working method was found to be the best for laboratory use.

The Erlenmeyer flask containing 75 to 100 cubic centimeters of linseed oil was heated, the air above the oil was displaced by carbon-dioxide gas and the flask stoppered with a rubber stopper containing a bent glass tube which was immediately connected to the rubber tubing from the culture tube. The Stewart clamp was then opened and a partial vacuum was created when the hot oil cooled. The carbon dioxide in the flask diffused across, and as the linseed oil absorbed the oxygen, the bacteria began to grow when the oxygen-carbon dioxide tension became optimum. This is a simple method, not requiring apparatus which is not obtainable in any laboratory, and seemingly produces ideal atmospheric conditions for culturing those organisms which require an increased carbon dioxide tension; as well as those organisms which require reduced oxygen tension. The gas tension can be controlled, as the growth of an organism reaches an optimum, by closing the Stewart clamp and detaching the Erlenmeyer flask containing the oil. Should the bacteria fail to grow further, after detaching the flask, the oil may again be heated, more carbon dioxide added, and the flask attached to the culture tube as

before. The growth may be thus accelerated from time to time, as the occasion warrants.

Figure 3 shows the oil heating while at the same time the media is being inoculated. Figure 4 shows simple method of displacing air with carbon dioxide.

For those organisms not requiring carbon dioxide tension it was found that the most rapid reduction of oxygen took place when the oil was heated and a good commercial paint dryer added as a catalytic agent, to the hot oil, and the simple set-up shown in figure 2 used.

Figure 5 shows the simple method of closing, and making airtight, the system prior to incubation.

The materials necessary for this method of growing anaerobic organisms are (1) the usual culture tube containing the media to be used, (2) two rubber stoppers in which a short piece of bent glass tubing has been inserted, (3) an Erlenmeyer flask, (4) small pieces of chemical rubber tubing, and Stewart clamps, (5) linseed oil and a good commercial paint dryer—which may be procured from any dealer in paints, (6) tank of carbon dioxide—from operating room of hospital or frozen section department of laboratory. The final satisfactory set-up is shown in figures 3 and 5.

#### CONCLUSION

It is believed that this simple method of culturing anaerobic organisms is practical and can be applied in any laboratory.

*Appreciation.*—We are indebted to Capt. William H. Bell, Medical Corps, United States Navy, for his support and encouragement. To Lieut. Fred M. Rohow, Medical Corps, United States Navy, head of department of bacteriology at this school, who carried out the culturing and proving the practical application of the method. To F. A. Chevrefils, laboratory technician, United States Navy, and to Frank H. Alderman, gas analyst, United States Navy, for the many analyses made.

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#### THE IMPORTANCE OF THE CHANCRE IN THE HISTORY OF MEDICINE<sup>1</sup>

By C. S. BUTLER, Captain, Medical Corps, United States Navy

Someone has said that the history of medicine is not a steady ascent such as could be represented by a vertical line, but rather a devious course such as might properly be pictured as a spiral. It seems accurate to liken it to the spiral ascent of an airplane which has been accompanied by many accidents. In arriving at its present

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<sup>1</sup> Presented at the 1934 meeting of the American Association of the History of Medicine.



FIGURE 2.

Inoculating media while oil is heating. Note rubber stoppers fitted with bent glass tubing, lying on sterile gauze, ready for insertion.



FIGURE 3.

The simplified set-up being connected, after culture tube containing media had been inoculated and the oil heated.



FIGURE 4.

Displacing air above oil with carbon dioxide gas. Note culture tube containing media which has previously been inoculated and rubber stopper ready to be inserted in flask.

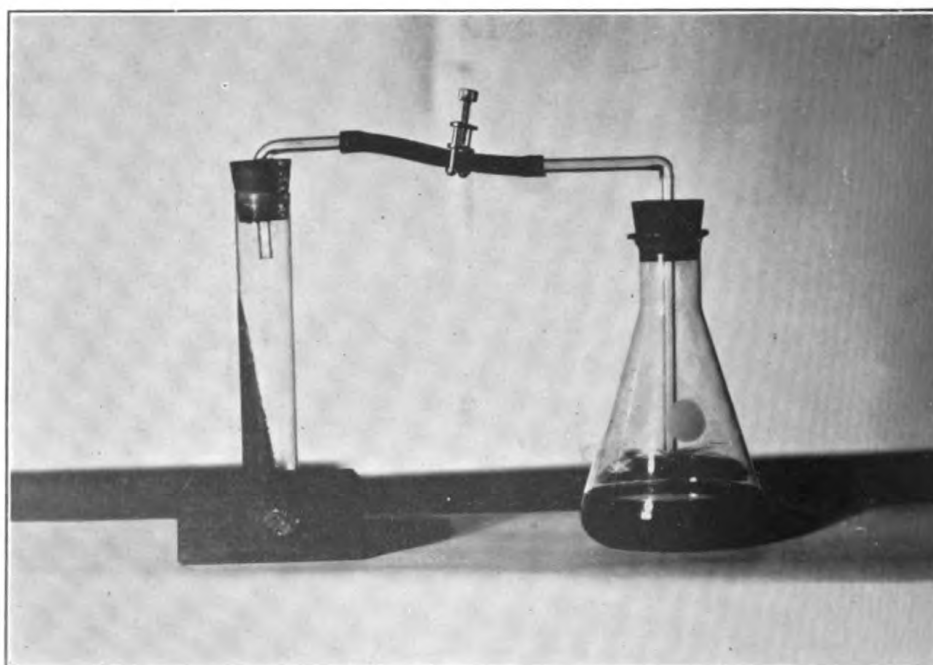


FIGURE 5.

Apparatus complete (with Stewart clamp) and ready for incubator.

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exalted position the ship of medicine has had many "side slips" and not a few "tail spins." No department of medicine so truly shows this as does that of the venereal diseases.

Just as in airplane construction, the discovery of new principles enables us to throw overboard designs, patterns, and theories that are outmoded or rendered obsolete, so in medicine the discovery of new facts, or the perfection of new designs enables us to place new and better interpretations upon matters of disease which we formerly viewed through a glass darkly, or to scuttle old apparatus in favor of those improvements which give us a short cut to the diagnosis of disease and its cure.

We state here categorically that the Roman physician, Celsus (1) described a type of genital sore which could only have meant the chancre and that though he did not know it was the initial lesion of a constitutional disease, he *did* know that it was different from another common ulcer of the genitals which he also describes, and not simply a healing stage of one type of ulcer. After nearly 2,000 years we moderns have accumulated enough knowledge to read Celsus' protocols, for we know that the only common ulcers of the genitals are chancre and chancroid. We know that the only genital lesion likely to be confounded with them in the male is cancer and we also know from our accumulated statistics that cancer of the penis is one of the rarest forms of cancer. Here is Celsus' description of ulcers of the penis: "Now whether the intumescence has been overcome by the latter method, or whether it never did resist, ulcers will be found within the posterior part of the prepuce, or on the glans penis, or on the penis itself beyond the glans; *these ulcers will necessarily be either clean and dry, or moist and purulent*. If they be dry, they must be first fomented with hot water; afterwards lycium with wine is to be laid on, or oil-lees boiled with the same, or butter with rose oil." Now several physicians in former times have referred to these Celsian descriptions of genital ulcers. No one has done it with greater insight than did Frederick Buret (2) in the year 1889. He says:

"In sections 9 and 10, the author speaks of certain diseases of the anus, such as haemorrhoids, etc., and of others situated at the vulva; then he adds, in section II—

"Fungo quoque simile ulcus in eadem sede (anus vel os vulvae) nasci solet.

"An ulcer resembling a fungous growth may also occur in these same parts (the anus or entrance of the vulva).

"This certainly refers to papulo-hypertrophic syphilides, for the vegetations are not ulcerated. And it cannot be cancer, which Celsus describes quite well in a separate chapter of book V, stating that it

is rarely observed, except in the old (*cancer fit maxime in senibus*). (Lib. V, cap. XXVIII, sec. 2 and 3.)

"There certainly exists great confusion in the description we have just read; but the theory of the duality of the chancre with the distinction of each virus can certainly not be exacted from the author. He states what he has seen—and it is quite creditable to have been able to see—before the Christian era: that there were phagedenic chancres; that is to say, circumscribed, with much suppuration; then, again, others do not suppurate, and, finally, those whose principal characteristic is hardness and insensibility. To these last he even refuses the name of ulcers, for he frequently observed that this symptom is often less than nothing. The patients of our times, who come to tell us, as a simple precautionary measure, that they have something on their penis (*aliquid in cole*), do not express themselves differently from Celsus. It only remained for the Roman physician, to be 20 centuries in advance, to reduce these species, which he believed distinct, to two fundamental types."

Celsus embalmed these exact descriptions of penile chancres in classical Latin and his medical works were not discovered until 1443 A.D. in the city of Milan. The ship of medicine was in the tail spin represented by the Dark Ages. The pilot who brought her out of this tail spin was no less a scientist than Fracastoro himself. Think how infinitely inferior to Celsus' description of genital ulcers is that of the great Veronese (3). This is Dryden's translation of the 1530 picture painted by Fracastorius of the initial stage of syphilis.

How shall posterity admire our skill,  
Taught by our muse to know the lurking ill,  
And when his dreadful visage they behold,  
Cry, this is the disease whose signs of old  
Th' inspir'd physician in bright numbers told.  
For tho' th' infernal pest should quit the earth,  
Absconding in the hell, that gave it birth;  
Yet after lazy revolutions past  
The unsuspected prodigy at last,  
Shall from the womb of night once more he hurl'd,  
T' infect the skies, and to amaze the world.  
What therefore seems most wondrous in his course  
Is that he should so long conceal his force;  
For when the foe his secret way has made,  
And in our *intrails strong detachments laid*;  
Yet oft the moon *four* monthly rounds shall steer  
Before convincing symptoms shall appear;  
So long the malady shall lurk within,  
And grow confirm'd before the danger's seen;  
Yet with disturbance to the wretch diseas'd,  
Who with unwonted heaviness is seiz'd,  
With dropping spirits, his affairs pursues,



And all his limbs their offices refuse,  
The cheerful glories of his eyes decay,  
And from his cheeks the roses fade away,  
A leaden hue o'er all his face is spread,  
And greater weights depress his drooping head;  
Till by degrees the secret parts *shall show*,  
*By open proofs the undermining foe*;  
*Who now his dreadful ensigns shall display,*  
*Devour, and harass in the sight of day.*

From the days of Fracastoro, who died in 1553, up to 1700 our knowledge of the venereal diseases steadily increased with minor side slips so that in 1692 Gabriel Le Clerc in his *Compleat Surgery* gave a modern description of gonorrhea and the pox. Then occurred the event which was to give to our knowledge of the venereal diseases the greatest and most enduring set-back since the days of Celsus. I refer to the work of Jean Astruc. Born in 1684 he died in 1766. In 1736 Astruc published his volume *Demorbis venereis, libri sex* in 4to. Paris. The several editions and translations of this work completely ruined our conception of the venereal diseases for 100 years. Astruc has been pilloried by all physicians who have a proper knowledge of the damage he wrought for medicine. The best job has been accomplished by his own countryman, A. J. L. Jourdan (4) who says:

“Finally, a man whose merits have been greatly exaggerated, but whose vast learning and great patience in historical researches cannot be denied, undertook a work, which had its erudition been aided by a more just and severe criticism, would have established his reputation on the most solid foundation. I allude to J. Astruc. Convinced beforehand that syphilis had been brought from America—that it was a new disease—that it had not been propagated by the French—that its symptoms in his time differed from those it presented when first introduced, and that it had passed through several distinct periods, he wished all to be subservient to his views.

“He adopted implicitly the stories of Oviedo—rejected as inaccurate and false, the observations of those who contradicted him, and when he found this impossible, attempted to weaken them by artful, and sometimes ridiculous reasonings: gave in some instances a wrong sense and meaning to the works he read—went so far as to corrupt the text of the original—and from garbled extracts drew conclusions contrary to the sense they present when read in the order assigned them by the author—and even did not fear to commit a number of chronological errors, much less pardonable in him than in any other.”<sup>2</sup>

<sup>2</sup> *De morbis veneris, libri sex*. in 4to. Paris, 1736. The second edition, enlarged with three additional books, appeared in Paris in 1740; the third, enriched with notes by Astruc himself, was printed in 1755; and the fourth in Venice in 1760. The French translation, in which the bibliographical part has been omitted, contains useful annotations by Louis, in 8vo. Paris, 1777.

"Notwithstanding all this, his designs succeeded, and his historical romance on syphilis was universally applauded, and soon boasted as many defenders as readers. Among them may be mentioned, Samuel Schaarschmidt, Fortune, Antony Cren, Haller, Van Swieten, Robertson, Cullen, Turnbull, Bertrandi, Arnemann, etc.." to which list we add the name of William A. Pusey (5).

We will not recount how John Hunter perpetuated the damage launched by Astruc, but in order to put ourselves en rapport with conditions in Hunter's day, we will quote a few sentences from a contemporary and great admirer of his, William Nisbet, whose volume *First Lines of the Theory and Practice in Venereal Diseases*, was published in 1787 just a year after Hunter's *A Treatise on the Venereal Disease* made its appearance. Nisbet says: "This alteration in the present case has been termed chancre, and from the different appearance it assumes, it is properly divided into three species, the *ulcerous*, *lymphatic*, and *vesicular*." Then after giving Hunter's interpretation of how to explain gonorrhoea and chancre as due to a single virus, Nisbet gives the following on chancre:

"The occurrence of chancre is not just so frequent as that of gonorrhoea, and from calculations which have been made by some authors, they may be considered as *1 to 4*. The period from the time of infection at which they make their appearance, is generally, however, sooner than gonorrhoea, and this seems connected with the very manner of its introduction in such cases. Some have alleged it to be later, though in all instances that have fallen under our observation the reverse has taken place; for in some, their appearance we have met with so early as in the course of a few hours, though the medium of their attack is from *24 to 36 hours to 4 or 5 weeks from the date of infection*."

From Nisbet's descriptions we can easily see what damage had been done to medicine by Astruc and Hunter. Nisbet's descriptions of genital lesions are incomparably inferior to those of Celsus, Fracastoro, and LeClerc. How poor his understanding of syphilis when compared with the picture of its early stage as given by Fracastoro. Not only did he hopelessly muddle knowledge of gonorrhoea, but it is evident from the incubation period quoted for chancre, i.e., from 24 hours to 5 weeks, that he was confusing the two types of ulcer of the genitals so clearly defined by Celsus.

Not until 1860 did our knowledge of the venereal diseases reach the high plane it occupied before Astruc and Hunter, and it will forever be a matter to wonder at that our profession still holds their names in such high esteem in the subject under discussion. Their influence still smoulders in certain sections of the profession even to the present day.

## CONCLUSIONS

1. A. Cornelius Celsus should have the credit for the first description of chancre and chancroid.
2. Medicine should consign the works of Jean Astruc and John Hunter upon the venereal diseases to the oblivion which they so richly deserve.
3. Hero worship has no place in medicine.

## REFERENCES

1. A. Cornelius Celsus on Medicine, in eight books.
2. Syphilis in Ancient and Prehistoric Times by Dr. F. Buret, Paris, France translated from the French, with notes, by A. H. Ohmann-Dumesnil, M.D.
3. Dryden's (Tate's) Translation of Syphilis Sive Morbus Gallicus.
4. Historical and Critical Observations on Syphilis by A. J. L. Jourdan, M.D., translated from the French by R. LaRoche, M.D., Philadelphia, published by Robert Desilver, 110 Walnut Street, 1823.
5. The History and Epidemiology of Syphilis by William Allen Pusey, published by Charles C. Thomas, Springfield, Ill., 1933.

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**MEASUREMENT OF THE SPEED OF ADJUSTMENT OF THE EYE TO NEAR AND FAR VISION**

By C. J. ROBERTSON, Lieutenant Commander, Medical Corps, United States Navy

From 232 B.C., when Archimedes first propounded the law governing the flotation of bodies in liquids and gases, until 1914, at the beginning of the European war, the mechanical progress of aviation was slow and often unimpressive. The event of the great war caused the use of the airplane on a greater scale, with a consequent rapid mechanical improvement, which is shown in speed, such as the west-to-east flight of Col. Roscoe Turner in 10 hours 5 minutes and 30 seconds; or of endurance, when Paul Coudas and Maurice Rossi made a nonstop distance and speed record of 5,900 miles from New York to Royak, Syria, in 55 hours and 49 minutes.

With the improvement of the airplanes, their necessity, from a commercial as well as a military standpoint, was foreseen. The importance of the airplane and the airship in our present scheme of life is known; their future staggers our keenest imagination. But with this tremendous increase in speed, the altitude obtainable and all that the airplane and airship has brought us, man remains physically unchanged in this new sphere. He, and he alone, is responsible for the movement of this mechanical monster. He, and he alone, has the responsibility of those who accompany him into the air, no matter how mechanically perfect the machine may be.

A new phase of life has begun. In January 1911 there were only 543 licensed pilots in the world and only 26 in the United States; at present, there are over 16,000 licensed pilots in the United States alone. The active military pilots compose only a small group of this number, yet they have been, and are, the nucleus around which the primary training is established.

With this new phase of life in which we have become involved the necessity of the physical well-being of the pilot becomes a momentous factor. Physical standards have slowly been evolved by the medical profession as their understanding of the problems of the air have progressed. Many factors have had to be taken into consideration. Just as the mechanical part of a plane has been studied by the engineer, so has the physical and psychological reaction of man been a source of study by the physician.

As age progresses many physical disabilities develop, among which eye conditions stand out prominently. One phase of study by the physician has only been lightly touched upon; speed of vision. At the present time there is no means in use for testing speed of vision by the Department of Commerce, the United States Navy, or the United States Army. We feel that some method of this measurement should be a necessary adjunct to the physical examination of the pilot, and particularly so of the pilot in the military services.

It is felt that a standard of speed of vision should be established. Ferree and Rand of the Wilmer Institute of Johns Hopkins Hospital, Baltimore, Md., have developed an apparatus, called the tachistoscope, for this purpose. It has been my pleasure to test a few men with this apparatus. The tests were too few to form any definite conclusion as to the value of the machine or to cause any definite conclusions as to the standard of speed; but it has confirmed my opinion that speed of vision plays an important part in the physical ability of the aviator, and that an intensive study along these lines should be instituted with a view to establishing such a standard.

The tachistoscope is an apparatus so mechanically adjusted that the procedure in examination is as follows: There are three test objects, the letter E separately rotatable in eight positions, which are adjusted on the same vertical line as the eyes. The two near test objects are far enough apart so that the far object can be discerned between them. The entire three objects are illuminated by approximately 5-foot candles of light. An adjustable headrest is used to place the observer's head so that he can fixate on the first E at the left at a distance of 30 centimeters, the far test object at 6 meters, and the second near test object at 30 centimeters, on the right. Thus, with the rotating plates directly in front of the near test objects so timed that the speed can be recorded in degree values, which can be transposed into seconds, the measurement of the speed



TACHISTOSCOPE COMPLETE.



of near vision, near to far, and far to near, is accomplished. Now, as an example, an observer, is placed before the apparatus, his head in the headrest so that his eyes are directly in line with a horizontal slit through which all test objects can be seen. The test objects are set at various angles and the rotating time mechanism is ready for movement. The observer is directed to fix at a marked spot on the rotating apparatus directly in front of the near E on the left. The time mechanism, timed on this preliminary run for what has been found to be an average speed, is started. The observer attempts to read the three E's, naming them after the completion of the entire revolution of the time mechanism. A number of trial runs are made to accustom the observer to the apparatus. The test is then continued, shortening or lengthening the speed, until a conclusion is reached as to the speed of vision of the observer.

Table 1 shows the degree values and the time values in seconds as recorded by the tachistoscope, and includes data which is considered of value in attempting to evaluate the necessity of the apparatus and the necessity of speed of vision. Such data includes the age of the observer, his flight hours, years in aviation, visual acuity near and far, phorometer findings, pupillary distance, angle of convergence, and depth perception.

Table 2 shows a series of tests of midshipmen between the ages of 18 to 24, with their visual acuity near and far.

Table 3 compares the speed of vision of the young midshipmen and the older aviators.

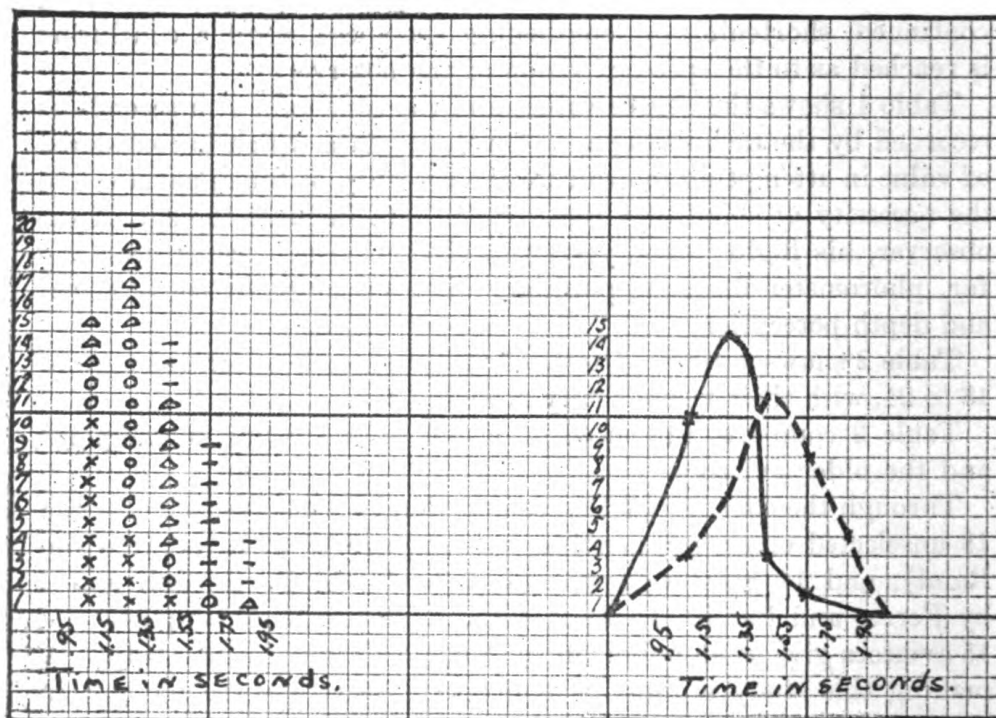
Through the courtesy of Ferree and Rand I have been able to add 18 unselected observers, nonglass-wearers, age 18 to 40 (Ferree and Rand), and 14 glass-wearers, age 22 to 44, 10 by Goodall and 4 by Ferree and Rand. These observers with the 15 midshipmen and 15 aviators give us an opportunity to make a comparative study. In making this study it must be understood that they are too few in number for any final determination, but are valuable only as an estimate for future study with hundreds of cases as a basis.

In evaluating these particular cases it is found that in the entire group of 62, considering only the time factor: "Near to far and return to near"; of the 15 which completed the test between 0.95 second and 1.15 seconds, 10 are midshipmen and 3 are aviators. In the group between 1.15 seconds and 1.35 seconds, 10 are aviators and 4 are midshipmen. In the other 3 groups with the longer time element are found only 1 midshipman and 3 aviators. It is considered that the midshipmen and aviators are picked men physically and should demonstrate a more rapid measurement of speed than the unselected groups. This they have definitely done. The unselected group (nonglass-wearers) predominate in the group between 1.35 seconds and

1.55 seconds, while the glass-wearers are found mostly between 1.55 seconds and 1.75 seconds.

Considering that the midshipmen and aviators are picked men from a standpoint of visual requirements, it should be emphasized that the midshipmen predominate in the group between 0.95 second and 1.15 seconds, while the aviators are in the group between 1.15 seconds and 1.35 seconds. The age of the midshipmen is between 18 and 24, while that of the aviators is between 30 and 38.

Table 4 demonstrates very definitely the speed element in the two main groups, i.e., midshipmen and aviators, as compared with the unselected cases.



X = Midshipmen (18-24)—solid line indicates aviators and midshipmen.  
 O = Aviators (30-38).  
 Δ = Unselected.  
 Nonglass-wearers (18-40)—broken line indicates unselected cases.  
 — = Glass-wearers (22-44).

There are a number of comparative studies which could be made, such as glass-wearers and nonglass-wearers, midshipmen and aviators, and so on; but it is not considered of merit until more cases can be used. A study of various phases of the index, such as "near to far", in comparison to "far to near", will be of importance. Also, a study of the measurement of speed under ocular fatigue.

Dr. Ferree states that there are two types of tests for speed of vision, i.e., a static test and a dynamic test. The eyes fixate in the static test and accommodate for a selected distance upon the test





ROTATING FAR "E".

278-1



TACHISTOSCOPE.  
Showing the operator and observer in position.

278-2

object. This is considered only suitable for the testing of the speed of the reaction of the sensorium. This would not test eyes with an inferior oculomotor facility or even if there was a partial motor paralysis.

In the dynamic test for speed of vision, the eyes are required to shift from a near object on the left to a far object in the median plane and then return to a near object on the right. Thus, the first change involves, besides the discrimination of the object, the relaxation of the muscles of accommodation and divergence and a lateral movement to the right; the second change involves accommodation for near vision and a converging and a lateral movement still further to the right, constituting three factors which contribute to the final result—speed of reaction of the sensorium, speed of accommodation for both near and far, and speed of coordinated eye movement.

In youth the speed of reaction of the sensorium and the speed of accommodation is so rapid that it is probable the value of the tachistoscope will only be found in detecting the abnormal eye, but, as the age factor creeps in, the speed of accommodation decreases and thus it may be that a determination of the age limit of flying may be established. It is very possible that a standard of speed may be evolved for entrance examination of midshipmen, or that by such examination the abnormal eye may be discovered and thus be a source of value.

Only multiple examinations, including aviators of various ages, different refractive errors, muscular imbalances, etc., will show the value of the tachistoscope, or some like mechanism, and give us a standard of speed either for a given age or for speed of vision necessary for piloting certain types of planes.

Ferree and Rand in 1918 completed a series of tests on the inertia of the adjustment of the eye for clear seeing at different distances. Their purpose in making the tests was to ascertain whether eyes rated normal by clinic tests could not be more finely graded as to their working efficiency or fitness for special purposes. In 1929 they completed a series of tests for intensity of light and speed of vision, noting the greater effect produced by the intensity of light.

Teft and Stark in 1922 state that, while this method of testing speed of accommodation with the tachistoscope is satisfactory in determining the actual speed, it is also a test to a certain extent of immediate memory. This I have found to be true. But this can be overcome to a certain extent by practice runs, although some subjects do find it difficult to adjust themselves to this particular test.

TABLE 1.—*Aviators, age 30 to 38*

No.	Observer	Age	Flight hours	Years in aviation	Degree values				Time values				Visual acuity	Eso. at 6 m	Exo. at 6 m	Eso. at 33 cm	Exo. at 33 cm	Hypo.	P. D. (Prism)	Accom.	Angle	D. P. (depth)
					Near	Near to far	Far to near	Complete	Near	Near to far	Far to near	Complete										
1	F. R. S.	30	1,000	5	3	67	55	125	0.027	0.603	0.493	1.125	20/15	4+			5+			9.0	59	12
2	A. C. D.	31	1,500	13	3	82	50	135	.027	.738	.450	1.215	20/20	4+		3+		4	8.0	65	10	
3	W. M. B.	30	1,500	7½	5	71	59	135	.045	.639	.531	1.215	20/15		3+		2+		10.5	65	5	
4	G. E. L.	32	2,500	6	4	82	54	140	.036	.438	.486	1.260	20/20				4+	4	8.5	65	7	
5	E. S. W.	32	1,160	7	3	82	50	135	.027	.738	.450	1.215	20/20	2+			3+	C. 2+	8.0	64	5	
6	E. O. S.	33	1,487	5	4	71	65	140	.036	.639	.585	1.260	20/20+7	1.5+			10+	4	8.0	58	10	
7	D. K.	33	2,700	11	4	61	115	180	.036	.549	1.035	1.620	20/20		1+		2+		6.5	54	10	
8	N. D. M.	34	1,800	10	3	67	65	135	.027	.643	.585	1.215	20/15	2+		8+		9	8.5	58	7	
9	G. B. S.	34	1,800	10	3	67	70	140	.027	.603	.630	1.260	20/20		6+		4+		8.5	57	8	
10	B. H. J.	35	2,808	8	3	72	70	145	.027	.648	.630	1.350	20/20		1+		10+	8	6.5	54	15	
11	A. F. J.	35	1,650	10	3	67	70	140	.027	.603	.630	1.260	20/15	3+			6+	7	8.0	56	14	
12	A. E. B.	36	1,400	8	3	107	40	140	.027	.963	.260	1.260	20/20	3+	1+		6+	8	7.0	60	10	
13	J. D. L.	38	2,115	11	3	87	60	150	.027	.783	.540	1.360	20/20	2+			4+	8	6.5	62	13	
14	W. J. C.	38	1,200	7	7	63	45	115	.063	.567	.405	1.035	20/20	4+	1+		3+	5	6.0	58	10	
15	A. D. R.	38	1,350	9	3	77	68	140	.027	.693	.690	1.260	20/20	3+				6	6.0	56	12	

TABLE 2.—*Midshipmen, age 18 to 24*

No.	Name	Age	Visual acuity		Degree values				Time values			
			Far	Near	Near	Near to far	Far to near	Complete	Near	Near to far	Far to near	Complete
1.....	E. W. C.....	19	20/15	J.I.	2	63	50	115	0.018	0.567	0.450	1.035
2.....	J. L. J.....	20	20/15	J.I.	3	72	55	120	.027	.648	.495	1.080
3.....	A. M.....	19	20/15	J.I.	3	62	60	125	.027	.558	.540	1.125
4.....	F. J. H.....	18	20/15	J.I.	3	67	55	115	.027	.603	.495	1.035
5.....	W. S. A.....	24	20/15	J.I.	3	67	50	120	.027	.603	.450	1.080
6.....	A. H. B.....	21	20/15	J.I.	3	77	50	130	.027	.693	.450	1.170
7.....	F. W. H.....	20	20/15	J.I.	3	82	60	145	.027	.738	.540	1.305
8.....	E. R. C.....	18	20/15	J.I.	3	82	65	150	.027	.738	.585	1.350
9.....	J. O. K.....	19	20/15	J.I.	3	77	55	135	.027	.693	.495	1.215
10.....	L. F. D.....	18	20/15	J.I.	3	67	50	120	.027	.603	.450	1.080
11.....	D. A. B.....	19	20/15	J.I.	3	62	50	115	.027	.558	.450	1.035
12.....	C. J. J.....	20	20/15	J.I.	3	62	55	120	.027	.558	.495	1.080
13.....	K. L. D.....	20	20/15	J.I.	3	67	45	115	.027	.603	.405	1.035
14.....	N. D. M.....	19	20/15	J.I.	3	62	55	120	.027	.558	.495	1.080
15.....	C. H. C.....	18	20/15	J.I.	3	67	55	125	.027	.603	.495	1.125

TABLE 3

## MIDSHIPMEN (18-24) AVERAGE TIME VALUES

No.	Near	Near to far	Far to near	Complete
15.....	0.0264	0.6216	0.486	1.122

## AVIATORS (30-38) AVERAGE TIME VALUES

15.....	0.0324	0.6738	0.5563	1.2576
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## TIME VALUES—DIFFERENCE

No.	Near	Near to far	Far to near	Near to far to near (complete)
15.....	0.006	0.0522	0.0508	0.1356

Goodall finds that uncorrected astigmatic errors and conditions of muscle imbalance tend to retard the speed of adjustment to a marked degree, and considers that the tachistoscope is not only useful in determining the speed of adjustment, particularly that of accommodation, but also in detecting defects of vision which are not readily revealed by the Snellen's test letters. He, being convinced that accommodation enters in many ways into the act of flying a ship, especially in landings and in pursuit work, when very rapid change of focus from far to near and near to far is required, feels that the measure of the time element is necessary.

Richmond and Ebert in 1933 performed a series of tests for speed of visual perception to arrive at some conclusion as to a reasonable time necessary to recognize letters and colors. They tried three

methods; flash-letter tests, projection lantern, and camera-box shutters. They concluded that a time factor should be included in our visual acuity examinations; that 0.5 second is a good standard unit for each eye; that visual speed by daylight is decidedly faster than by artificial light; that a few candidates with slow color perception apparently compensated with rapid form perception; that color perception is not diminished as rapidly as form perception by shortening the period of observation; and that speed of perception for both eyes is twice that of monocular vision.

Berens and Smith, in ophthalmologic standards for aviation, state that rapid reaction time is most important for the military and public aviator and that a means should be established for such recognition.

The Bureau of Medicine and Surgery of the United States Navy in November 1933 made a change in the physical qualifications for diving and submarine duty, in that a standard of 4 seconds to read all letters on the 20-foot line has been adopted.

Ferree and Rand, Goodall, Teft and Stark, all completed their tests with the original tachistoscope, developed by Ferree and Rand in 1917 and 1918, which has been considerably improved upon by them in 1932 and 1933. This improved tachistoscope we used in our tests.

#### SUMMARY

Due to the rapid mechanical advancement of the airplane in a short space of time as evinced in tremendous speed; rapid maneuverability; plus the necessity, particularly in military aeronautics, of aerial gymnastics; diving, as in dive bombing; close formation flying; etc., etc., it would seem that speed of vision is an essential part of the physical makeup of the aviator, and that a knowledge of such vision with ability to judge the limits should be a portion of the flight surgeon's knowledge of each pilot.

Such work as has been done by Ferree and Rand, Goodall, Teft and Stark, Richmond and Ebert, plus the tests we have recorded, lead me to believe that a more intimate knowledge of speed of vision is essential in order that a flight surgeon may keep abreast of the development of the airplane. This article has been written with the hope that it may stimulate an interest in this theme, particularly of the flight surgeons and the physicians trained in ophthalmology.

#### CONCLUSION

1. That speed of vision in aviation is essential, and that measurement of such speed can be made.
2. That a standard of measurement of such speed can be accomplished if sufficient tests are made with men of various ages and various age conditions.

3. That such a standard, when accomplished, should be incorporated in the visual requirements of aviation.

4. That such tests disclose the pathological eye and may be of use in the preliminary examinations for the Naval Academy.

#### BIBLIOGRAPHY

1. Aviation Physical Examination, United States Navy Standard 1931, Manual of the Medical Department, United States Navy.

2. Bureau of Medicine and Surgery Circular Letter 572—1933 of November 10, 1933. Change no. 19 manual of the Medical Department, United States Navy, 1927, regarding physical qualifications for diving and submarine duty.

3. Ferree, C. E., and Rand, G.: Intensity of Light and Speed of Vision. *Journal of Experimental Psychology*, Vol. XII, no. 3, October 1929.

4. Ferree, C. E., and Rand, G.: The Speed of Adjustment of the Eye for Clear Seeing at Different Distances. *Tr. Am. Opth. Soc.*, 1918.

5. Goodall, E. B.: The Speed of Accommodation. *American Journal of Ophthalmology* 2, 3, series 63, November 1918.

6. Berens, Conrad, M.D., and Smith, Henry Templeton (M.D.); Present Ophthalmologic Standard for Commercial Aviation in the United States. *Tr.*, of the Am. Academy of Opth. and Otolaryngology.

7. Richmond, P., Lieutenant Commander (M.C.), United States Navy, and Ebert, E. C., Lieutenant Commander (M.C.), United States Navy.: Speed of Visual Perception.

8. Teft, L. E., and Stark, E. K.: Speed of Accommodation as a Practicable Test for a Flier. *Amer. Jour. Opth.* 5: 339, 1922.

9. Department of Commerce: Physical Standards for Airplane Pilots Including Standards for Lighter than Air Pilots. Revised July 1, 1930. United States Government Printing Office, Washington, D.C., 1930.

10. War Department, Army Regulation, Medical Department: Standard for Physical Examination for Flying. United States Government Printing Office, 1931.

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#### A NAVAL MEDICAL OFFICER WITH THE CIVILIAN CONSERVATION CORPS

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When the telegrams from the Navy Department came on May 15, 1933, ordering nearly all of the naval medical officers then on shore duty to report to the Secretary of War, the first thoughts to cross most of our minds were those of sudden disappointment. These were fortunately replaced with the thrill of new experiences as we became acquainted with our new stations and duties.

From our naval stations most of us were ordered by the War Department to nearby Army posts. Here we were assigned quarters and put to work at various duties, one day acting as officer of the day at the post hospital, the next day examining the new recruits for the Civilian Conservation Corps. One Saturday morning 3 of us with the assistance of a contract (civilian) physician and 2 enlisted men, under the guidance of a major in the army medical corps, examined

456 new men, vaccinated them, gave them their first typhoid inoculation and signed their enlistment papers, in 3 hours. The aforementioned procedures constituted "processing." The physical requirements which were set up for admission to the Civilian Conservation Corps were naturally very much less strict than those for the regular services, and we were able to work that much faster. The Army major who had charge of this work cautioned us not to be too particular and amplified the regulation in his own inimitable way with this comment: "If his heart will stand a day's work he is O.K., provided he has good enough vision so that he will not fall in the creek without seeing it."

As the various companies of approximately 200 men each were moved from the "processing centers" to suddenly announced destinations in the "woods" a medical officer accompanied most of them. The first officer of our group was sent from Fort Meade, Md. to Pocatello, Idaho within 36 hours after he reported. The rest of us lived in a state of similar tense expectancy. Only those who have been through it can realize the expenditure of energy involved in buying a set of new uniforms for an unknown demand, getting the various trunks and boxes together, disposing of the car and a thousand other items. The proposed orders for the rest of the group were suddenly changed from the above destination and the author of this article was assigned on June 2, 1933 to the 335th Company at Townshend, Md., to relieve the Regular Army medical officer who had left his post at Fort Meade to join the company a week previously.

On "proceeding without delay" to the general region indicated on the map at the post headquarters the first surprise in store was the road into camp. Besides being difficult to find it had mired nearly every vehicle which had attempted to traverse it during the previous week. A standard detail of 20 men to extricate cars from the series of mud holes had been established. The next surprise was the color of the company, which consisted of a group of 200 Negroes from Baltimore, Md.

After the formalities of reporting were over, a brief reconnaissance revealed that the camp was situated in a cleared area of about 6 acres which in the not-too-distant past had been a farmyard. The natives knew the location as the "The Old Goat Farm", because the last inhabitants of the delapidated farmhouse which occupied the north center of the plot, had brought several hundred angora goats from Texas in the hopes of making a small fortune, only to lose most of them for lack of forage.

Geographically the surrounding country was part of the coastal plain and was low and rolling. The tract on which the camp was located was called "The Cedarville State Forest" and consisted of an irregular-shaped piece of land of some 2,400 acres. It was built



up through the State buying land for delinquent taxes; this also accounted for its very irregular shape. The camp was about 23 miles by road southeast of the United States Capitol.

The company had arrived on this scene on May 27 in the best of spirits and full of enthusiasm, but before the tents could be pitched and properly secured, one of the worst thunderstorms of the summer struck in all its fury, laying low many of the tents, destroying the day's rations, and drenching the bodies and dampening the spirits of officers and men. Further storms hit them on succeeding days. In addition to this stormy weather and the lack of a passable road into camp, trouble seemed to pyramid that first week. One of the regular Army officers was taken sick, the truck which had been assigned to the camp broke down completely, and as a climax a group of 25 threatening Negroes gathered at the company commander's tent and demanded immediate transportation back to Baltimore. The captain was a capable Army officer and was not dismayed. He tried to reason with them, but found he was losing ground. Finally he told them in which direction Baltimore lay, that it was 54 miles, and that they could start walking any time they chose. One hundred percent were present for breakfast the next morning.

The beginning of the second week was ushered in by warm, dry weather, and the company's work and morale improved steadily.

Camp construction was begun in earnest. After the tent floors were built the first project, the need for which was becoming more acute as the weather grew warmer, was bathing facilities. The officers tried to bathe out of wash basins, or accepted the offer of the 5-mile distant State police station to use their shower; most of the men just did not bother. However, by the fifteenth of June we had cold showers for all, although they were a third of a mile to the east of camp. The cold was both real and apparent, as the water came unheated, directly from a spring in the edge of the woods 50 feet away.

The second crying need which received attention in the meanwhile was a mess hall. For the first month the meals were cooked on two Army field ranges set up under a tent fly. Thus the food was prepared, cooked, and served in the open. The men lined up at meal times in two lines, received their portions in their Army mess kits, and sat down on the ground to eat and battle flies. The white personnel of the camp fared little better, though they had iron camp chairs and a field table covered with a sheet, generally of doubtful cleanliness. During those first weeks the pestilence of flies, especially at meal times, was frightful. This was due to some extent to the unsanitary conditions about the camp, but more to the stables of neighboring farmers. Control of these was out of the question; control of the men was almost as difficult. However, little by little

we pounded home the elements of field hygiene, so that by July 1, when we moved into the mess hall, we were in a position to actually control the fly menace. Nothing in the whole history of the camp gave us more satisfaction than this accomplishment.

During the first week in July hot water was added to the shower system and cold water was piped to the camp area. Previous to this all the water used within the camp proper was obtained from a 30-foot well adjacent to the old farm house. The water was raised by the laborious method of the old fashioned windlass, or a bucket on the end of a rope. A little later a modern hand pump was installed, but even this did not compare to the luxury of being able to simply turn a faucet not far from your tent and fill a pail in a few seconds. From the very first day to the twenty-third of December all the drinking water was chlorinated in the now very familiar Lyster bags, and it was a constant task to educate the men to the belief that a little medicine (chlorine) in the water was not bad tasting and that all the water in the well, springs about camp, swamps, etc., was very unsafe. This was a difficult thing to impress on city-bred Negroes used to drinking water already purified and obtainable from any faucet at hand. Offenders were penalized anywhere from 25 cents to 2 hours of swatting flies in the mess hall, if they were caught drinking unchlorinated water. The byword in camp became "It will cost you a quarter if 'the man' catches you drinking that water!"

At this point a brief discussion of the camp organization is desirable before taking up further details of the camp life. The white personnel of the camp was divided into two executive groups, the Army group which was charged with clothing, housing, feeding, and educating of the men, and the maintaining of discipline, proper hygiene and sanitation, and the forestry group which was responsible for the work of the men in the woods and the transportation of the men to and from their place of work. In this camp the Army personnel consisted of 3 Army officers, at first 2 regulars and 1 reserve, but later 3 reserve officers. One of these was the commanding officer, another was responsible for the finances and property, while a third had charge of the mess, post exchange, and motor transportation. The fourth officer, in this case a naval medical officer, was responsible for the health and sanitation of the command. He was also charged with the organization and development of the educational program.

Four enlisted men of the Regular Army were attached to the camp and assisted the officers in the administration. In January two of these were ordered back to their Regular Army posts, and the other two in March. These men left vacancies which were hard to fill in our



GENERAL VIEW OF THE CAMP.  
(C.C.C. Camp, S-54.)



company. To assist in the camp routine 24 members of the company were granted us and constituted the "Overhead." These were divided as follows: 4 cooks, 2 student cooks, 5 kitchen police, 1 dining room orderly, 2 bath and latrine orderlies, 1 water system man, 1 supply man, 1 mess steward, 1 man in charge of quarters, 1 company clerk, 2 truck drivers, 1 "first sergeant" or senior foreman, who was responsible for the camp details and work formations, and 2 first-aid men. The latter rotated on the three jobs which were the direct concern of the medical officer, viz., the hospital, the incinerator, and mess-kit wash water.

The forestry personnel were organized as follows: A camp superintendent in charge of all the work, 2 graduate foresters, 1 engineer, 2 technical foremen, 4 local foremen, and 1 blacksmith. The latter was a jack-of-all-trades and was a valuable asset of our camp, manufacturing for us in his spare time such things as boot scrapers, wrought andirons, a grease skimmer for our grease traps, letter openers, ax handles, etc.

Over each of these subdivisions of the camp were their respective supervisors—for the Army a subdistrict supervisor, a line officer, and a medical officer (who incidentally was a naval medical officer); and for the forestry department the State and district officials. The subdistrict supervisors visited the camps once a week, checked on the organization, sanitation, construction, and accounts. They in turn were responsible to district supervisors and to Third Corps Headquarters in Baltimore, Md.

In this organization of the camp the medical officer found himself charged with the health and sanitation of the command, but not (as we are generally used to) in an advisory capacity only. He was also what the company commander chose to call a "fatigue officer", i.e., his recommendations were frequently carried into execution by himself. If a new soakage pit needed to be constructed or the latrine seat covers had been put on wrong, he was given a squad of men or a carpenter, as the case might be, and charged with the task. Perhaps a short rehearsal of a typical medical officer's day is the best way to describe his duties.

Let us start with reveille on the day the medical officer had charge of camp. He took his turn as "officer in charge of camp" every third or fourth day, depending on the number of line officers at the camp with him. Reveille in summer was at 5:30 a.m., except for a period of 3 weeks in August, when it was held at half past 3 so that the men could work during the cooler part of the day. At reveille the officer stood by at the center of company to lend dignity to the occasion and firmness to the commands as the "first sergeant" took the roll call and gave the men calisthenics. Fifteen minutes after

veille was the breakfast hour and a half hour after that police and sick call were held. The former consisted in a general tidying up of the camp area and was taken part in by the whole company. The latter is self-explanatory and was held at the hospital. At first the hospital consisted of an ordinary wall tent, 16 feet square, set apart for this purpose. We made tables and shelves out of boxes and scraps of lumber and put the commonly used pills in old mayonnaise jars, empty hair-tonic bottles, and any other miscellaneous containers we could salvage from the kitchen or dump. It is not far amiss to say that ingenuity in all tasks was fully as valuable as professional skill in those first few months.

The original medical equipment for the camp consisted of a regulation "medical and surgical field chest." In it was found a good field operating kit of instruments, but the company had left so hurriedly that checking and replacement of the missing drugs had not been accomplished. The War Department quickly realized the inadequacy of equipment for such camps of 6 months' duration and issued an additional list of supplies which could be requisitioned as needed. However, before these could be obtained through the regular channels some startling, though we trust harmless, pharmacological properties were assigned to the drugs on hand. At the first sick call the chest was emptied completely in search of the tincture of iodine. None was found, but some tubes labeled "iodii et potas. iodii" were discovered, with the contents expressed in grams, and from this information an aqueous 3 percent solution was made. There was no sodium bicarbonate in any form in the chest or the kitchen. Bandage was plentiful, but adhesive tape was limited to a few yards of 1-inch width. There were six  $\frac{1}{4}$ -pound bottles of chloroform, but no ether, procaine, or ethyl chloride. A plentiful supply of suture material was present, but not a needle could be found. It goes without saying that all the essentials noted above came with our first requisition.

With this particular company one could accomplish far more in the treatment of a severe contusion, for example, by giving the patient some ointment to apply, even if it was only petrolatum, than he could by telling him to bathe the injured part in hot water and massage it well. In the absence of acetylsalicylic acid, sodium salicylate became the best cure for headache or toothache that money could buy. A weak solution of table salt replaced Dobell's solution as a gargle.

At the regular morning sick call the medical officer examined and prescribed while the bandaging and dispensing was done by the two first-aid men. These were regular members of the company who had received a little training at the army post where they were processed

and later received further training in camp. They became fairly proficient assistants and were also taught to make a sanitary inspection of camp, test the water for chlorine, and similar duties. The first of these men had had a year and a half of college and could undoubtedly lay claim to the best handwriting in camp, officers and forestry personnel not excepted.

At sick call the chief complaint varied with the season; in summer it was generally an intestinal symptom, in the fall a respiratory. In response to the question, "What's your trouble?" the answer often came back, "Doc, I got a misery." Such a symptom could not be found in modern textbooks, neither is it often heard north of the Mason-Dixon Line; but it is one of the expressive ways of the Negro in describing his pain, wherever the location. One cold morning in December a big, strapping young Negro appeared at the hospital tent rubbing his stomach with one hand and his head with the other. When asked what was his trouble he replied very seriously, "Doc, I got a misery in my belly and a swinging in my head."

The number of men at the regular week-day sick call averaged 6 to 8 men depending somewhat on the weather. In addition to this, first-aid treatment of various kinds was given at all hours, bringing the daily average of the sick roster to 10 or 12. The most common lesion was that of a minor injury, such as an abrasion, incised wound, etc.; the entire company was very particular to have all their minor cuts and scratches treated at least with tincture of iodine, so that the number of total treatments for some months would run as high as 500. As long as this did not interfere with work it was not discouraged due to the rare complication which occasionally arises from just such an injury.

After the men were diagnosed and treated the question of disposal had to be decided. The Army medical system has provisions for three dispositions of men who come to sick call: (1) Duty, (2) quarters, (3) hospital. Duty is self-explanatory. The men marked "quarters" received treatment in the camp; at the discretion of the medical officer they could be called upon for light duty, although there was no such thing as light duty as a method of disposition. If a man was likely to be retained in quarters more than 5 days we were requested to send him to Walter Reed General Hospital in Washington, D.C. The case was then marked "hospital." The above hospital was the nearest and only hospital to which we were allowed to transfer patients. Transportation for the sick and wounded, whether from the woods to camp or from the camp to the hospital, was by truck for the first 6 months. A cot was roped in place, the patient well padded above and below with Army blankets, and the driver cautioned to go slowly. On three occasions an ambulance from Walter

Reed came down for serious cases, and in December an ambulance was provided to serve the six camps in our subdistrict, whose headquarters was at Beltsville, Md. This was a well-equipped, heated ambulance, but much to the distress of the Civilian Conservation Corps driver, had a governor which permitted him a maximum speed of 28 miles per hour although this was later advanced to 35 miles per hour.

After sick call the work formation was held and the men turned over to the forestry department for them to use on their various projects. The work of conservation in this forest consisted of five main projects: (1) Cutting boundary line. This consisted of clearing an 8-foot line around the boundary of the forest by removal of enough trees to clearly indicate the boundary and act as a fire break. (2) Constructing fire lines. This consisted of making a path 2 to 3 feet wide dug down to mineral soil and cleared of leaves and other debris. (3) Building roads and trails, and maintaining them. This included the construction of bridges across streams and swamps. (4) Improvement cutting. This consisted of removing undesirable individuals in order to obtain the maximum growth of the forest. The problems of water shed and soil erosion are intimately connected with this phase of the work. (5) Fire prevention and suppression. In addition to the above main items the men cleared several miles of streams, put up several miles of telephone lines, planted trees, cleared prospective camp grounds, etc. When weather permitted, part of the men were transported by trucks to the Doncaster State Forest 30 miles southwest of the camp, and also to the Myrtle Grove State Game Preserve nearby, in both of which places they did the same types of work noted above.

After sick call the medical work for the remainder of the day consisted of several things pertaining to sanitation, and of various Army reports which were new, unfamiliar, and mastered not without some difficulty.

We were sufficiently separated from civilization so that we had to provide our own water supply, sewerage, and waste disposal plants. For a permanent camp of 200 men this was no small task. All of these systems went through a process of evolution from the immediate temporary methods to the systems necessary in a permanent camp. To describe the several stages of development would be interesting but too lengthy.

The water system eventually came to consist of a 1-cylinder gasoline pump which sucked water from a barrel sunk in a small spring about one third of a mile to the east of camp, pushed it into an adjacent 1,000-gallon tank from which it was forced by air pressure to the camp area. On December 18 our commercial chlorinator was installed, and all the water used in the camp was chlorinated at its





CAMP DISPENSARY (WITH RED CROSS) AND HEADQUARTERS BUILDING.



source. The hospital detail (medical officer and first-aid men) learned how to run the pump and assumed responsibility for standardizing and charging the chlorinator. The amount of free chlorine in the water was checked daily by the starch-iodide test (potassium-iodide crystals and homemade starch solution).

The sewerage and waste-disposal plants were divided into three parts. First, the latrines were of the regular field type ("deep pit and fly proof"). They were satisfactory and simply required one conscientious orderly to take care of them. The garbage problem gave us more trouble. We tried the cross-trench incinerator with an old oil drum, the type commonly described in field manuals, but found it inadequate in size, difficult to operate, and almost impossible to keep in repair for more than a day at a time. After 2 to 3 weeks of struggling with this we were completely relieved of the task, as the farmers fairly raced each other into camp to get the garbage for their "fox hounds" and swine. This, unfortunately for them and for us, had a sudden ending, as hog cholera broke out in the fall in the western part of the State, and at the request of the Federal inspector, incineration or burial of the garbage was made compulsory for all camps in our subdistrict. By this time we were able to profit by the experience of other camps, and authority was given to purchase the necessary materials locally and construct an incinerator. This was done in accordance with the plans evolved by the subdistrict inspectors. The incinerator, though simple in design and a glutton for wood, was efficient and easy to operate. No doubt the incinerators described in the abbreviated service field manual will be improved as a result of the Civilian Conservation Corps experiences. Incidentally all medical officers in this corps area were asked to criticize, correct, and suggest improvements of the material in this manual. Some worthwhile changes should result to the value of both services.

Third, the liquid kitchen wastes required some method of disposal. The various types of grease traps recommended were found to be inadequate, and no seepage into the ground occurs if all the grease is not removed. After experimenting with the various contrivances we finally constructed a series of pits with several baffles and had the camp blacksmith fashion us a homemade grease skimmer built like a crab net and covered with mosquito screening. By daily skimming and dusting with lime we had a nearly clear and odorless effluent.

Another sanitation hazard which required a great deal of time and thought was flies. For the first 2 or 3 weeks they were an Egyptian plague. Control of them was the most difficult problem we had, especially in the mess hall. The first line of defense was education, exhortation, and punishment for the men who failed to

use the latrine, or dropped food of any kind around the camp. The second was a group of large cubical fly traps, about 2½ feet in size. We manufactured these ourselves out of scraps of lumber and mosquito screening, baited them with fermented corn sirup, and they literally caught thousands of the pests daily. After the small issue of fly paper ran out, the sanitary detail of the camp experimented with some of the homemade tanglefoot concocted of rosin, sugar, and castor oil. With it we coated bailing wire, scraps of mosquito screening, and glazed paper blotters; they worked. With the help of these and the old-fashioned method of swatting, to which we added the refinement of collection of the dead flies in a container half full of water, we managed to keep the upper hand, although it was a constant fight until a 17° above zero cold wave arrived in November.

In addition to the hygienic and sanitary aspects of the work the day was occasionally punctuated with the arrival of a man from a work detail who had accidentally cut himself with an ax or had been hit by a falling tree. During the first 6 months of the camp only two men were injured severely enough by falling trees to be marked quarters; both of these were transferred immediately to Walter Reed for an X-ray examination. There were several ax cuts, all small, and not involving tendons.

Contrary to expectations there were no bites by poisonous snakes; in fact, not a single poisonous snake was found in the vicinity by any of the company. However, a creature a thousand times more numerous and occasionally as venomous was the wood tick, *Dermacentor variabilis*. The personnel of the camp was instructed as to the dangers and prophylaxis against the bites of these insects. Only one known case of "tick bite fever" developed, but unfortunately this one proved fatal. It was the Rocky Mountain spotted fever type.

On August 25, 1933, the order from the War Department came out extending the Civilian Conservation Corps another 6 months. This was welcome news for most of our company as only 43 men requested discharge, most of them to take up employment elsewhere. The vacancies in the company were filled by new men who had been conditioned at Fort Meade; they joined the company in October about 2½ weeks after the termination of the first period, September 30, 1933.

On the third of October ground was broken for the barracks, but it was not until November 9 that actual erection of the buildings began, due to the delay in arrival of the lumber. However, when it did arrive the buildings sprang up like mushrooms and by November 25 all the men and officers were more securely, though not much more warmly housed in barracks. No stoves of any sort arrived

until December 12, but within 24 hours after that we had some heat in each building. During this time the showers had been moved into the new bathhouse within the camp area, the mess hall had been insulated and otherwise prepared for winter, tents had been struck, and the whole camp had taken on a permanent aspect.

Another project in the winter construction program was a hospital. The need became acute, especially on the cold mornings, for to differentiate between the abdominal "miserics" in an open tent with the thermometer ranging around 10° to 20° above zero at the time of sick call, and with both men and medical officer shaking with cold, required good luck as much as good judgment. The policy of ordering the questionable cases to bed and examining them a piece at a time under blankets, after the other patients had been cared for, had to be adopted.

The hospital was originally intended to occupy one end of the administration building which also served as a barrack for the officers and forestry personnel, but due to the company being colored it was thought best to separate the two. Authority was granted by Third Corps Headquarters to construct a separate hospital building 20 by 30 feet with a dispensary, office, operating room, and a ward for 6 patients. While this was being done a cold wave struck us and we moved into the "day room" of the officers' quarters for a week. We endeavored to make the hospital one of the show places of the camp. The grounds surrounding it were graded and planted with shrubbery, a Geneva cross was erected on the outside, the woodwork was all painted white and finally to give it a naval tint the floor was painted a battleship gray.

In addition to his professional duties, on November 7, the medical officer began to delve into the relative merits of third grade arithmetic books, the latest quotations on blackboard crayon by the box, the price of cheap cedar pencils, etc., all in the performance of his duties as educational officer. The goal as established by the district supervisor was to completely wipe out illiteracy and raise the present level of education the equivalent of one school grade. A rather large order. We soon had classes in forestry, construction of roads and bridges, nature study, hygiene and sanitation, and arithmetic and English. During the first few weeks, one 25-watt bulb provided illumination for 50 men in some of the classes for it was not until January 19, 1934 that the permanent lighting system was completed. This was an old type of generator with a 4-cylinder gasoline engine, but at night the camp seemed like Broadway after the pale gloom to which we had been accustomed.

As part of the Nation-wide educational program for the Civilian Conservation Corps camps an educational director was sent to the camp the latter part of February. He devoted his whole time to

the educational and welfare work, thus lightening the rather heavy duties of the officers and making the program more personal and attractive to the men. Undoubtedly this phase of the camps in seeking to build men with a better sense of mental, moral and physical values is the most significant secondary result which has arisen. If the objectives which have been set up can be attained a tremendous amount of good will be done in the communities to which the men return, as the educational program is aimed at social as well as scholastic improvement.

As one of the projects of the "New Deal", it must be conceded that the Civilian Conservation Corps has been one of the most successful. Undoubtedly it has developed even more than its sponsors anticipated, and outgrowths have appeared which exceeded expectations. A very great deal of credit is due the Army for its effective organization and conduct of the work. Those of us in the Navy who have been associated with the work have learned much, and should be worth more to our own service when we return. It is both a hope and a compliment to wish that, if ever conditions are reversed and some 200 Army medical officers find themselves transferred temporarily to the Navy, that they will be treated as courteously and considerately as we have been.

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#### THE EFFICIENCY OF CARBOXIDE GAS AS AN INSECTICIDAL FUMIGANT FOR NAVAL AND MERCHANT VESSELS

By E. W. BROWN, Captain, Medical Corps, United States Navy

##### PART I—TESTS ON NAVAL VESSELS

The writer determined in a previous study (1) the approximately minimum lethal dosages of carboxide gas for bedbugs and cockroaches in a relatively airtight chamber for varying periods under conditions imposing severe tests of penetration. These results are directly applicable to spaces aboard naval vessels where watertight closure is practicable but this will not hold for such spaces as state-rooms and sick bays where leakage must be taken into consideration despite special measures of closure to reduce such loss to a minimum.

The object, therefore, of this part of the present study was two-fold, i.e., (1) to determine the practicable lethal dosage of carboxide gas in spaces sealed by a specified procedure and (2) the degree of loss under these conditions.

For the purpose of brevity carboxide gas will be designated as carboxide throughout this report. It is a mixture of 1 part of ethylene oxide and 9 parts carbon dioxide, the two gases being compressed to a homogenous mixture in steel cylinders which are similar to commercial carbon dioxide containers. The pressure of a full

cylinder is 725 pounds per square inch at 70° F. The ethylene oxide is the toxic component, the carbon dioxide being added to eliminate any fire hazard. The carbon dioxide also materially increases the toxicity of the ethylene oxide by stimulation of the respiration of the insects. Both gases are 1.5 times as heavy as air. Carboxide has a faint but distinct etherlike odor easily recognized in concentrations required for fumigation. The mixture issues from the cylinder as a liquid, which is atomized to a fine mist, completely vaporizing within a few minutes at ordinary temperature. The toxicity was discussed in the previous paper (1).

The tests of this part of the report were conducted in conjunction with the material laboratory at the Navy Yard, New York, aboard the U.S.S. *Seattle* and the U.S.S. *Pensacola*. Staterooms, chief petty officers' berthing spaces, and a chief petty officers' mess room were selected as typical for the experiments. A fumigation period of 3 hours was adopted as convenient in that undue interference with routine activities on shipboard would be avoided.

#### TECHNIQUE

(a) *Method of sealing*.—A special form of sealing tape known commercially as Scotch masking tape of 3 inches in width was used to seal the seams of doors, if not of watertight construction, cracks, and other small openings in general. It adheres satisfactorily to wooden or metal surfaces, painted or otherwise, and leaves no residue or other defacement. For the purpose of brevity it will be designated as masking tape.

The grillwork or latticework attached to the upper margin of bulkheads in relation to such spaces as staterooms and chief petty officers' mess rooms was closed by means of ordinary brown wrapping paper. This was applied in a double layer to the side of the grillwork toward the room and secured at the upper and lower edges by means of masking tape. A coating of vaseline or engine grease was then applied to the inner surface for the reason that carboxide does not penetrate this material.

In the case of the outlets of ventilation louvers, the compartment ventilation was cut off, if practicable, the damper closed, and the louver opening covered with one layer of wrapping paper secured around the edge with masking tape, a coat of vaseline then being applied. If impracticable to close off the air supply, the damper was closed, the louver packed with waste and paper applied to the opening as already outlined above. If an entire watertight compartment was under consideration, such as the chief petty officers' berthing space of the *Pensacola*, it was possible to seal off the entire ventilation system at the point of entry and disregard the individual louvers.

Louver openings in doors, such as ordinarily obtain for staterooms, were closed on the inside by means of a double layer of wrapping paper secured by masking tape and covered with vaseline. The upper ends of corrugations in bulkheads were closed by masking tape. Particular care was taken to dog air ports down tightly.

Staterooms were finally darkened and carefully inspected from the inside and any cracks or other slight openings detected were sealed with masking tape. The sealing procedure outlined may be easily and quickly performed by the ship's personnel. The only item not carried at present in store is the Scotch masking tape which is relatively inexpensive and procurable in various widths.

(b) *Introduction of the carboxide.*—In tests of staterooms a cylinder of carboxide was balanced on a set of scales exterior to the space and the outlet connected to the room by means of flexible copper tubing; the door being opened to an extent only just sufficient to admit the latter. The scale was then adjusted to the weight desired, the gas rapidly released until the weights again balanced, the tubing instantly withdrawn and the seams of the door immediately taped.

The procedure with large spaces was to distribute cylinders within the compartment containing the approximate combined weight of gas required; the valves being opened and the door or doors quickly taped or dogged down. No measuring apparatus was needed under these conditions.

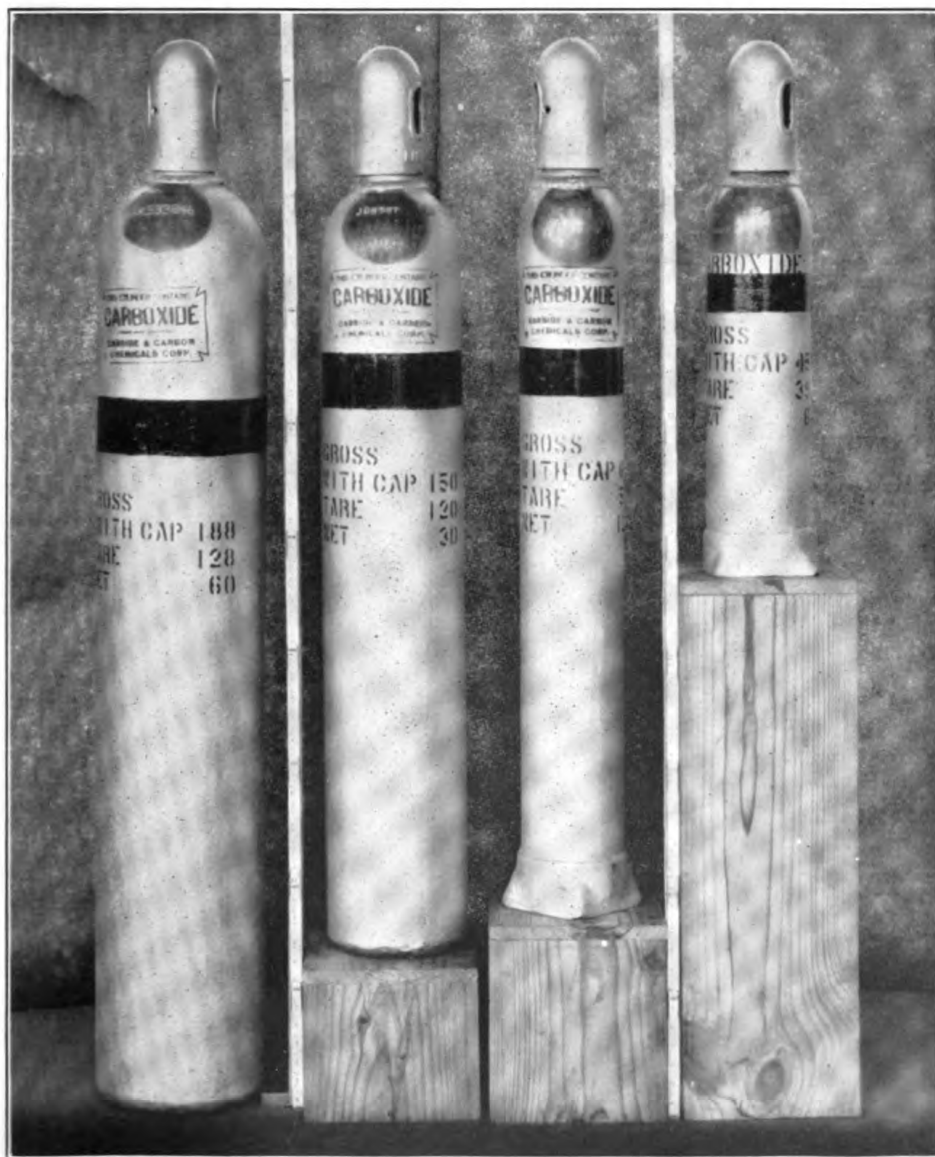
(c) *Position of insects.*—Artificial infestation was employed in the tests on naval vessels. The insects in each position were contained in large-sized pill boxes the covers being punctured with about 12 pinholes. The number of boxes per location varied from 1 to 6. The number of insects per box averaged 8. A sliding form of box of the type employed for powders by pharmacists was used for large cockroaches. The containers were so placed as to simulate varying degrees of harborage for the insects.

It will be understood that all lockers, drawers, traveling bags, or other enclosures in which test specimens were placed were kept closed during these tests unless otherwise stated. Locker doors were not provided with louver openings, unless so specified. The positions of the insects are indicated by numerals and described as follows:

Key  
no.

1. Buried in the middle of tightly packed clothing in top drawer of locker under bunk; stateroom, *Seattle*.
2. Between mattress and mattress cover on the under side of the former with a pillow placed between mattress and bunk springs; one blanket covering mattress and tucked in under pillow; stateroom, *Seattle*.
3. Bottom of small locker over washbowl; stateroom, *Seattle*.
4. Buried in the middle of tightly packed clothing in top drawer above desk; stateroom, *Pensacola*.





CARBOXIDE CYLINDERS OF VARIOUS SIZES.



Key  
no.

5. Buried in middle of clothing stowed on shelf of locker with louver openings about center of compartment; chief petty officers' berthing space, *Pensacola*.
6. In inside pocket of uniform coat tightly wedged in the mides of a mass of coats on hangers in port side locker; chief petty officers' berthing space, *Pensacola*.
7. In large traveling bag at the bottom of locker on port side forward; chief petty officers' berthing space, *Pensacola*.
8. In inside pocket of overcoat tightly wedged in the midst of a group of coats on hangers in locker at port side forward; chief petty officers' berthing space, *Pensacola*.
9. Between 2 blankets placed in turn between 2 mattresses lying flat, the latter covered by 2 blankets tucked in under the lower mattress; chief petty officers' berthing space, *Pensacola*.
10. In traveling bag contained in wooden case at port side aft; chief petty officers' berthing space, *Pensacola*.
11. Buried in clothing stowed on a shelf of a locker amidships at after bulkhead; chief petty officers' berthing space, *Seattle*.
12. In inside pocket of coat wedged in the midst of a group on hangers in another locker at after bulkhead; chief petty officers' berthing space, *Seattle*.
13. Loosely wrapped in towel and placed in a suitcase in a locker at forward bulkhead on port side; chief petty officers' berthing space, *Seattle*.
14. Buried in about the center of a mass of blankets filling locker with louver openings at after bulkhead on port side; chief petty officers' berthing space, *Seattle*.
15. Buried in approximate center of large laundry bag stuffed full of clothing and hanging in the open; chief petty officers' berthing space, *Seattle*.
16. Buried in about the center of a mass of toweling and rags on shelf of locker on port side; chief petty officers' mess room, *Seattle*.
17. In top left compartment of refrigerator; chief petty officers' mess room, *Seattle*.
18. In top right compartment of refrigerator; chief petty officers' mess room, *Seattle*.
19. In center of tablecloth folded upon itself 10 times and filling small compartment of locker at after bulkhead; chief petty officers' mess room, *Seattle*.
20. In lower right compartment of refrigerator; chief petty officers' mess room, *Seattle*.
21. Inside of suitcase on lower bunk in open; chief petty officers' berthing space, *Seattle*.
22. In open on desk, top of bunk and in locker with door open; stateroom, *Seattle*.

Nos. 1, 4, 6, 7, 8, 9, 10, 11, 12, 13, 16, 17, 18, 19, and 20 involved a very severe test of penetration to reach the insects; nos. 2, 3, 5, 14, 15, and 21, a moderate extent; no. 22, none except through container itself.

(d) *Controls*.—Control tests were conducted in 17 of 28 tests with bedbugs and in 17 of 19 tests with cockroaches. Control test boxes of the same number and content of insects as the experimental

specimens were kept in the immediate vicinity of the space during fumigation and transferred with the experimental specimens to the laboratory at the conclusion. Inspection was conducted the following morning simultaneously with that of the test specimens. The general order of the mortality rate of controls recorded in the previous study (1) prevailed in these experiments.

(e) *Analysis of the air for carboxide.*—Analysis of the air for carboxide was conducted at definite intervals during the fumigation as a check upon the loss of the gas by leakage, absorption, or adsorption. The U.C.C. all-service gas indicator was employed for this purpose. The apparatus, developed by the Linde Air Products Co., has been described in detail by Tompkins (2). The instrument in the present tests had been calibrated against fixed concentrations of carboxide set up in the fumigation chamber described in the former paper (1).

The apparatus was connected to the interior of the space under examination by rubber tubing one-eighth inch in internal diameter, the sample in certain tests being drawn from a point midway between the overhead and deck; in other experiments from the top, bottom, and deck and the three results averaged. Extreme care was exercised to adequately flush out the tubing prior to each analysis.

(f) *General procedure of the tests.*—Special closure of the space was first carried out unless means of watertight closure rendered this unnecessary. The test boxes of insects were then placed in position and circulation of the air begun. This was maintained in staterooms throughout by means of a 12-inch ventilation fan of the usual type; in the larger spaces with multiple 12-inch fans alone or reinforced by a portable motor-blower ventilating set. The introduction of the carboxide has already been described.

At the close of the test all doors and air ports were opened and the usual forced ventilation started. The test boxes were removed within a few minutes and the condition of the insects inspected. The final examination was held at 9 a.m., the following morning, the record as to ultimate kill being based thereon.

#### DISCUSSION OF THE EXPERIMENTAL DATA

(a) *The data of the tables.*—The headings of the tables to follow are in general self-explanatory. All data of concentration of carboxide represent pounds per 1,000 cubic feet. The initial theoretical concentration was computed by a division of the weight of carboxide introduced by the cubical contents of the space. The initial actual concentration is that determined by the U.C.C. all-service gas indicator at a definite time interval elapsing from the start. The final concentration is that determined by the gas indicator at

approximately the conclusion. The percent loss is based on the data for the initial and the final concentration.

The weighted concentration represents the average calculated concentration, examples of which are presented in the accompanying graphs. The ordinate is the concentration of carboxide as determined by the gas indicator and the abscissa the number of minutes. The successive areas under the curve represent the product of the concentration and time in minutes and the combined areas divided by the number of minutes involved yield the weighted concentration as determined for the first and second 90-minute periods; the average of the sum of these results being the weighted average concentration for 3 hours.

The term initial concentration will be used hereafter to represent the initial theoretical concentration for the purpose of brevity.

(b) *The cubical contents of spaces tested.*—The total cubical contents of the various spaces are presented in table 1, no deduction being made for displacement of the furniture or other fixtures contained therein.

TABLE 1

Space	Ship	Cubical capacity	Remarks
Stateroom U.....	Seattle.....	<i>Cubic feet</i> 775	Grill at inboard bulkhead. Forward bulkhead corrugated. Louvers in upper and lower door panels. 1 fan running. 1 ventilation louver sealed.
Stateroom V.....	do.....	880	Grill at inboard bulkhead. Forward and after bulkheads corrugated. Louvers in upper and lower door panels. 1 fan running. 1 ventilation louver sealed.
Stateroom 20.....	do.....	700	Grill at inboard bulkhead. Forward and after bulkheads corrugated. Louvers in upper and lower door panels. 1 fan running. 1 ventilation louver sealed.
Stateroom L.....	Pensacola.....	1,324	No grill. Bulkheads all flat. Louver in lower door panel only. 1 fan running. 1 ventilation louver sealed.
Stateroom M.....	do.....	765	Do.
Stateroom N.....	do.....	720	Do.
Chief petty officers' berthing space.	Seattle.....	10,056	No airports. 3 watertight and 2 ordinary doors. 3 fans and 1 motor-blower set running. 7 ventilation louvers sealed.
Chief petty officers' berthing space.	Pensacola.....	7,680	1 watertight and 1 ordinary door. Watertight closure for ventilation system. 5 fans running. 7 ventilation louvers.
Chief petty officers' mess room.	Seattle.....	3,840	Grill at inboard bulkhead. 2 doors with louvers in upper and lower panels. 2 fans and 1 motor-blower set running. 2 ventilation louvers sealed.

(c) Carboxide tests with bedbugs.—The data are presented in table 2 as follows:

TABLE 2

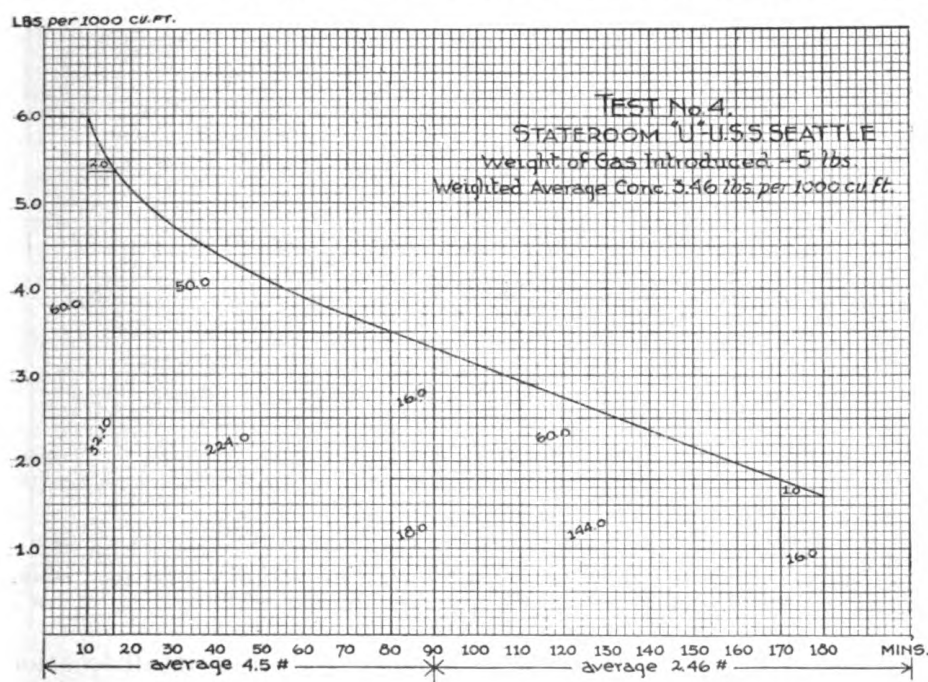
Test No.	Space	Ship	Added	Temperature average	Initial theoretical concentration	Actual initial concentration		Average weighted concentration	Final concentration	Percent loss
						Pounds	Minutes			
3	Stateroom U	Seattle	Lb.	° F.	Pounds			Pounds	Pounds	
4	do.	do.	5	74	6.4	6.2	15	3.8	2.3	64
7	do.	do.	5	78	6.4	6.2	10	3.5	1.8	71
9	do.	do.	5	74	6.4	6.2	24	4.4	3.4	47
11	do.	do.	8	76	10.3	8.9	17	5.3	2.9	72
2	Stateroom V	do.	9	75	11.6	11.4	18	7.5	4.8	58
5	do.	do.	5	74	5.7					
8	do.	do.	5	78	5.7	3.5	12		1.0	82
10	do.	do.	5	76	5.7	4.2	16	3.1	2.2	61
12	do.	do.	7	77	7.9	6.7	19	5.0	3.2	60
32	Stateroom 20	do.	7.7	76	8.8	8.5	22	7.0	5.6	36
33	do.	do.	4.5	79	6.4	3.5	15	2.7	2.0	69
13	Stateroom M	Pensacola	5.5	79	7.9	5.9	15	4.6	3.5	56
15	do.	do.	7	81	9.1	7.7	12	4.1	2.0	78
16	Stateroom N	do.	7.5	82	9.8	8.5	15	6.4	5.0	49
18	Stateroom L	do.	7.5	82	10.0	11.6	15	9.4	7.3	27
17	Chief petty officers' berthing space.	do.	7.2	80	5.5	5.3	15	3.7	2.5	54
20	do.	do.	60	84	7.8	6.0	15	5.2	4.7	40
19	do.	do.	56.5	84	7.3	5.3	15	4.4	4.0	45
24	do.	Seattle	75	84	7.5	7.3	15	6.8	6.3	16
22	Stateroom U	do.	75	78	7.5	6.6	15	5.8	5.0	33
23	do.	do.	6	77	7.7	5.6	15	3.8	2.3	70
26	do.	do.	6	73	7.7	7.7	15	4.9	2.8	64
27	do.	do.	9	81	10.3	8.5	15	6.2	4.5	56
29	do.	do.	9	80	11.6	10.2	15	6.6	5.0	57
21	Chief petty officers' mess room.	do.	8	85	10.3	7.3	15	5.5	3.7	64
25	do.	do.	25	90	6.5	5.6	30	4.6	3.5	46
28	do.	do.	30	89	7.8	7.3	30	6.5	5.5	30
	do.	do.	38	90	10.0	10.2	15	9.1	7.3	27

Test no.	Space	Ship	Number insects exposed	Ultimate kill		Controls	
				Partial	Complete	Number used	Number dead
3	Stateroom U	Seattle	32	1 (16)	2 (8); 3 (8)	32	0
4	do.	do.	40	1 (16)	2 (16); 3 (8)	32	2
7	do.	do.	40	1 (32)	2 (8)	24	2
9	do.	do.	16		1 (16)	16	1
11	do.	do.	48		1 (48)	48	4
2	Stateroom V	do.	48	1 (16)	2 (16); 3 (16)	48	3
5	do.	do.	46	1 (24)	2 (15); 3 (7)	40	2
8	do.	do.	32	1 (24)	2 (8)	32	0
10	do.	do.	40	1 (40)		32	1
12	do.	do.	48		1 (48)	48	3
32	Stateroom 20	do.	24		22 (24)		
33	do.	do.	24		22 (24)		
13	Stateroom M	Pensacola	48		4 (48)	48	2
15	do.	do.	48		4 (48)	48	1
16	Stateroom N	do.	48		4 (48)	32	2
18	Stateroom L	do.	24		4 (24)	24	1
17	Chief petty officers' berthing space.	do.	48	6 (8)	5 (8); 7 (8); 8 (8); 9 (8); 10 (8).	48	3
20	do.	do.	46	9 (8)	5 (6); 6 (8); 7 (8); 8 (8); 10 (8).	48	2
19	do.	Seattle	40		11 (8); 12 (8); 13 (8); 14 (8); 15 (8).	32	3
24	do.	do.	24		11 (10); 12 (3); 14 (6); 21 (5).		
22	Stateroom U	do.	9	1 (9)			
23	do.	do.	9	1 (9)			
26	do.	do.	24		1 (24)		
27	do.	do.	25		1 (25)		
29	do.	do.	24		1 (24)		
21	Chief petty officers' mess room.	do.	33	19 (8)	16 (6); 20 (8); 17 (4); 18 (7).		
25	do.	do.	31	19 (13)	16 (10); 17 (8)		
28	do.	do.	24		19 (24)		

NOTE.—The numerals under "Ultimate kill" not in parentheses are the key numbers for the position of the insects. Those in parentheses record the number in each position.

1. *Stateroom tests, Seattle.*—An initial concentration of 8.8 pounds or a weighted concentration of 7 pounds sufficed for a complete ultimate kill in position 1 which involved a very rigid test of penetration, the gas being required to pass through the seams of the locker doors to an inside drawer and finally to the center of a mass of tightly packed clothing therein. This simulated a degree of severity which would probably not be encountered in practical fumigation as all locker drawers, chests, etc., would be opened to facilitate access of the fumigant; clothing and bedding being so arranged as to facilitate penetration to the maximum.

A complete result was obtained for positions 2 and 3 with an initial concentration of 5.7 pounds or a weighted average concentration of

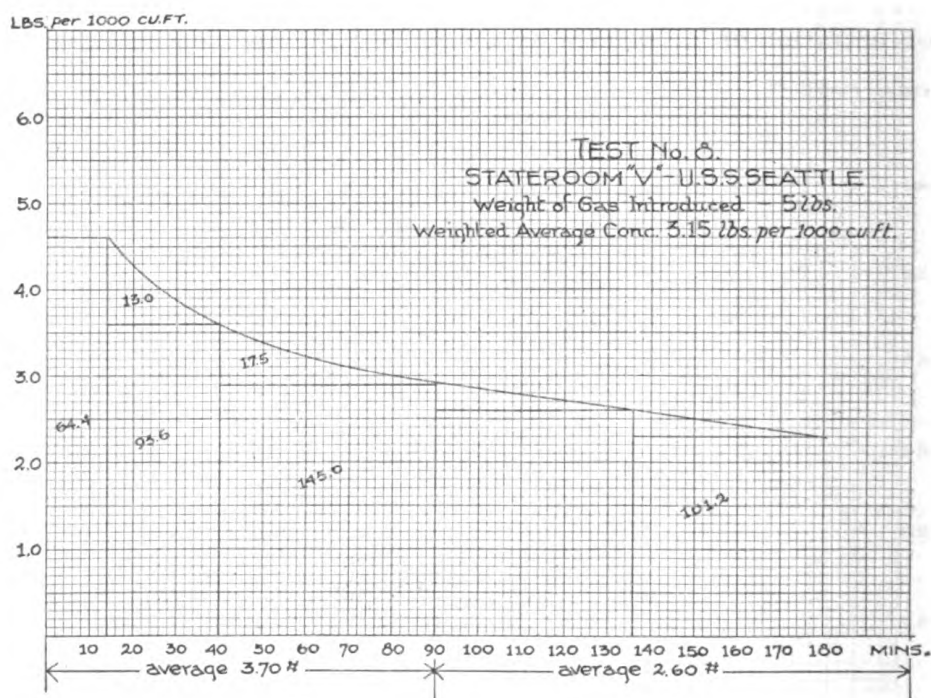


3.1 pounds; for position 22 with an initial concentration of 6.4 pounds or a weighted average concentration of 2.7. In position 22 the only penetration required was that through the walls of a test box.

2. *Stateroom tests, Pensacola.*—Position 4 imposing a severe test of penetration was selected for all four experiments. An initial concentration of only 5.5 pounds or a weighted concentration of 3.7 pounds was effective in stateroom L with a cubical capacity of 1,324 cubic feet. It is, therefore, concluded that a 6-pound cylinder of carboxide is sufficient for staterooms of approximately 1,000 cubic-foot capacity or less.

3. *Chief petty officers berthing space, Seattle and Pensacola.*—A complete ultimate kill resulted in test 19 of the *Seattle* in all five

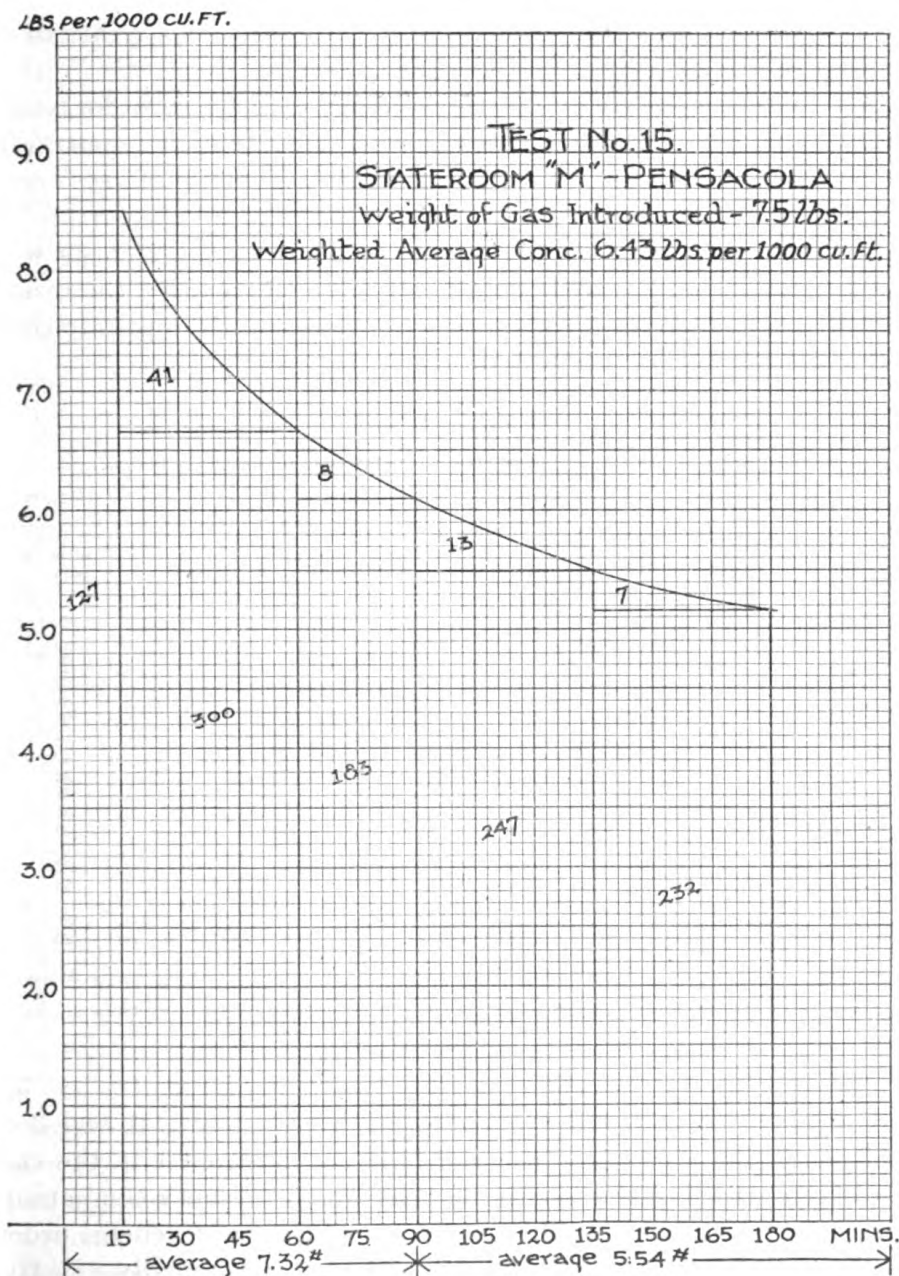
positions with an initial concentration of 7.5 pounds and an average weighted concentration of 6.8 pounds. A similar result was found in all four positions in test 24 with the corresponding concentrations of 7.5 and 5.8 pounds. These runs involved an extremely severe test of penetration in positions 12, 13, and 14 and a moderately severe test in positions 11, 15, and 21. For example, in order to reach position 13 it was necessary for the gas to diffuse into a clothes locker through the line of closure of the door, then to penetrate into a closed suitcase and finally to pass through a layer of toweling and into the pasteboard container.



In test 17 of the *Pensacola* a complete kill resulted in all locations except position 6 in which the outcome was partial. On the other hand, in test 20 a complete kill occurred in position 6, while in position 9 an incomplete result was found. It is believed that the lethal concentration of carboxide was marginal in these two positions, both of which imposed an extremely severe test of penetration. Positions 7 and 8, respectively, involved penetration into a traveling bag enclosed in a clotheslocker and into the inside pocket of an overcoat tightly wedged in a mass of such garments in the same locker. These conditions are decidedly more exacting than would be met with in ordinary fumigation practice when harborage for insects would be reduced to a minimum by the opening of lockers, luggage, chests, etc., and by the free exposure of clothing and bedding. It is concluded that a concentration of 6 pounds would be adequate with all avenues of approach opened up to a maximum degree.



4. *Chief petty officers' mess room, Seattle.*—We find in test 21 only 1 of 5 positions which escaped a complete ultimate kill with an initial concentration of 6.5 and an average weighted concentration of 4.6 pounds. This was position 19 which imposed the maximum difficulty



of penetration. The gas diffused sufficiently through the lines of closure of refrigerator doors for lethal effect. An initial and average weighted concentrations of 10 and 9.1 pounds, respectively, were required for position 19. It is concluded that a concentration of 6 pounds would have been sufficient if access of the fumigant had been

facilitated by opening all locker and refrigerator doors and the spreading out of the table cover and toweling.

5. *Average weighted concentrations.*—It will be noted that the data for the average weighted concentration in table 2 show considerable variation in certain experiments under conditions of equal initial concentration. The chief factor here involved appears to be variation in loss of carboxide by leakage.

6. *Temperature conditions.*—The average temperature for state-rooms during the tests varied from 74° to 85°; for chief petty officers berthing spaces 78° to 84°; for the chief petty officers' mess room, 89° to 90° F.

(d) *Carboxide tests with cockroaches.*—In 19 of the 28 tests with bedbugs parallel observations were made with cockroaches, the results being presented in table 3. Data of these tests, which duplicate those of table 2, have not been repeated.

TABLE 3

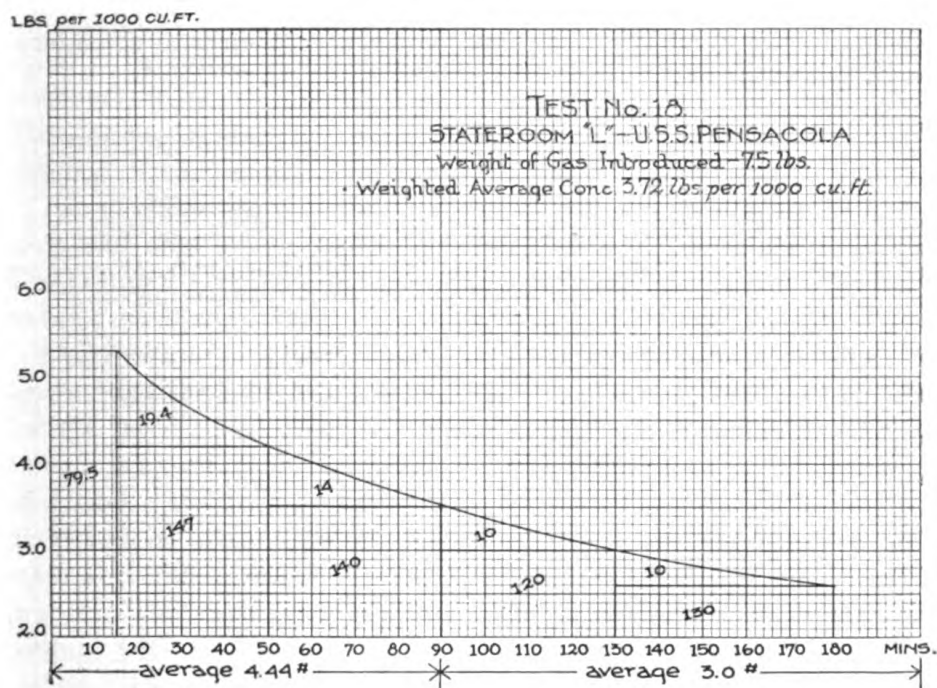
Test no.	Space	Ship	Number insects exposed	Ultimate kill		Controls	
				Partial	Complete	Number used	Number dead
3	Stateroom U.....	Seattle.....	32	-----	1 (16); 2 (8); 3 (8).....	24	3
4	do.....	do.....	31	-----	1 (7); 2 (16); 3 (8).....	24	2
7	do.....	do.....	40	1 (32)	2 (8).....	24	3
9	do.....	do.....	16	-----	1 (16).....	16	2
11	do.....	do.....	24	-----	1 (24).....	24	2
2	Stateroom V.....	do.....	48	1 (16)	2 (16); 3 (16).....	48	4
5	do.....	do.....	40	1 (16)	2 (16); 3 (8).....	40	4
8	do.....	do.....	24	1 (16)	2 (8).....	32	3
10	do.....	do.....	24	1 (24)	-----	24	2
12	do.....	do.....	24	-----	1 (24).....	24	2
15	Stateroom M.....	Pensacola.....	16	-----	4 (16).....	16	1
16	Stateroom N.....	do.....	16	-----	4 (16).....	16	2
18	Stateroom L.....	do.....	32	-----	4 (32).....	32	3
17	Chief petty officers' berthing space.	do.....	48	6 (8)	5 (8); 7 (8); 8 (8); 9 (8); 10 (8).....	48	4
20	do.....	do.....	33	-----	5 (8); 6 (8); 8 (8); 7 (9).....	32	3
19	do.....	Seattle.....	32	-----	11 (8); 12 (8); 13 (8); 14 (8).....	20	2
24	do.....	do.....	32	-----	11 (11); 12 (11); 21 (4); 14 (3); 15 (3).....	-----	-----
21	Chief petty officers' mess room.	do.....	40	19 (8)	16 (8); 20 (8); 17 (8); 18 (8).....	-----	-----
25	do.....	do.....	18	19 (4)	16 (9); 17 (5).....	-----	-----

A complete ultimate kill was obtained in positions 1, 2, and 3 of tests 3 and 4 but this result did not hold for position 1 in the case of bedbugs. In all of the remaining tests which present a comparison of the two types of insects, the results are of the same general order. It is concluded that a dosage lethal for bedbugs is equally effective for cockroaches, but whether the cockroach is the more sensitive to carboxide is not as yet definitely determined.

(e) *Immediate versus ultimate kill from carboxide.*—The characteristically delayed lethal action of carboxide in dosages insufficient to induce an immediate kill was emphasized in the previous paper

(1). This was again observed in the present series. A complete immediate kill was not observed in any of the experiments although in certain instances a partial immediate lethal effect was noted. In the majority of the tests none of the insects, either bedbugs or cockroaches succumbed during the period of actual exposure to the gas, but incipient weakness was commonly observed.

(f) *Percent loss of carboxide from spaces tested.*—The percent losses from the various spaces based on analyses with the U.C.C. all-service gas indicator were as follows:



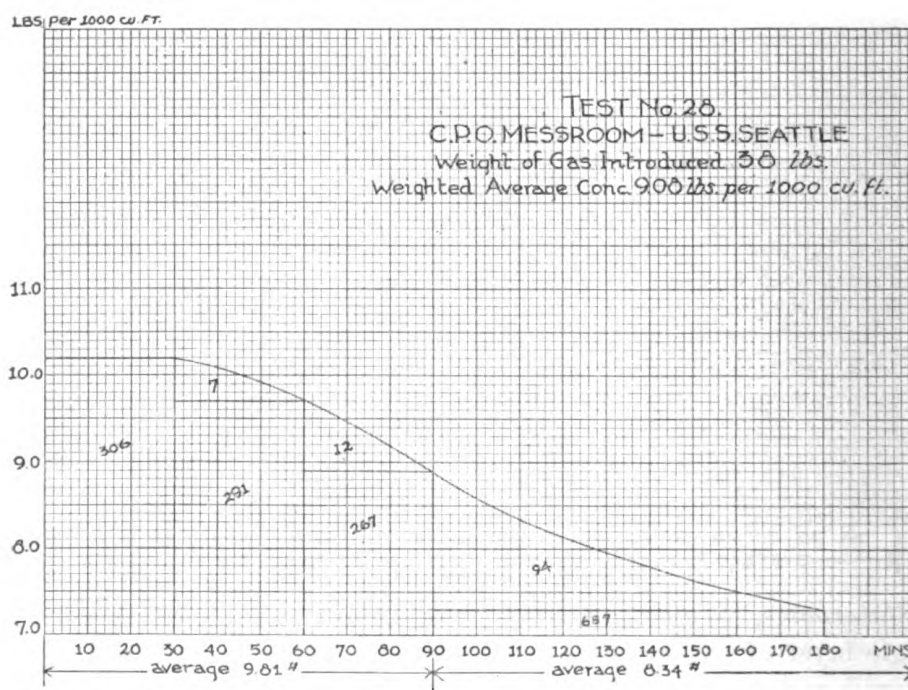
*Staterooms, Seattle.*—Sixty-four to eighty-two percent with a single layer of paper coated with vaseline applied to external aspect of grill and door louvers; 47 percent with a double layer; 58 to 60 percent with a triple layer. When applied to the internal aspect in double layer the average was 62 percent; in triple layer 58 percent. The general average of loss for both staterooms was 61 percent.

*Staterooms, Pensacola.*—Seventy-eight percent with a double layer coated as above applied to outside of door louver; 27 to 54 percent when applied to the inside aspect with a general average for all staterooms of 52 percent.

*Chief petty officers' berthing spaces and mess room, Seattle and Pensacola.*—For berthing spaces 16 to 45 percent, with an average of 33 percent; for the mess room 46 percent with a double layer of paper to the external aspect of grill and louvers of two doors; 27 and 30 percent when sealed on the inside; a general average of 34 percent.

The great bulk of loss of the fumigant was ascribed to leakage; a small fraction being absorbed in all probability by moisture in clothing, mattresses, etc., and a still smaller portion absorbed by exposed surfaces. Absorption and adsorption, however, did not appear to be of any practical significance for the reason that no tendency was shown to retention of the gas by these materials on ventilation subsequent to the tests.

With the technique of sealing outlined on page 2 an average loss of 70 percent is assumed for staterooms and 45 percent for spaces of the type of chief petty officers' berthing spaces and mess rooms; a liberal factor of unavoidable loss thus being taken into consideration in this estimate.



(g) *Rate of clearing of spaces from carboxide following fumigation.*—A pressing practical aspect of the study was to ascertain the time necessary for removal of the gas subsequent to the opening and ventilation of the various spaces. The possible persistence of carboxide in clothing, bedding, mattresses, etc., might result in undesirable or even injurious effects upon the personnel. The men first entering were instructed to hold their breath as long as possible while opening airports and doors and starting the ventilation system. The number of men was so adjusted that continuous exposure during this period did not exceed 2 minutes.

In the management of staterooms one man quickly opened the air port and withdrew, leaving the door open and the fan in operation. The concentration of carboxide on entering was usually

sufficient for moderate irritation of the eyes, nose, and throat. In all instances the room was safe for occupancy within 15 minutes, a slight odor only remaining. Four men were sent into the chief petty officers berthing space of the *Pensacola* to open 10 air ports and start the ventilation system. At the end of 15 minutes a faint odor could be detected which disappeared within an hour after opening. One test was completed at 1 p.m. and another at 5 p.m. No special measures were taken to aerate such materials as bedding, mattresses, clothing, etc. The bunks were occupied as usual the same night without discomfort or other sequelae in both instances. The conditions relative to the corresponding compartment on the *Seattle* were equally favorable. As this space is behind armor and therefore without air ports, greater persistency of the gas was anticipated. This, however, was not realized; nor was there any tendency to persistence of carboxide in the adjoining passageways.

The gas, therefore, diffused rapidly from all spaces in the various tests and none of the personnel experienced ill effects at any time. The fumigant, therefore, appears entirely without hazard for use on naval vessels when these simple and obvious precautions are taken.

(h) *Tests of penetration of the insecticide of the steam-atomizer type of apparatus versus carboxide.*—This type of apparatus depends for its insecticidal effect upon the projection of a nebulized vapor containing extract of pyrethrum as the lethal agent. The principle of action is that of a steam atomizer, the extract of pyrethrum being dissolved in a light petroleum oil which is aspirated into a jet of steam and disseminated therewith in atomized form. It is, therefore, projected in suspension in the air and a particle must effect actual contact with the body of the insect for toxic effect.

The "Tanglefoot" apparatus has been employed on certain ships of the fleet with a certain degree of success for the extermination of cockroaches in small spaces such as pantries and galleys. The extract of pyrethrum exerts an initial irritant effect tending to drive the insects into the open. The writer is not aware of any report as to its lethal efficiency for bedbugs. A much higher degree of penetration would be essential in order to destroy bedbugs, as these insects are far less liable than cockroaches to leave relatively deep harborage. It was, therefore, decided to conduct tests of penetration in relation to bedbugs.

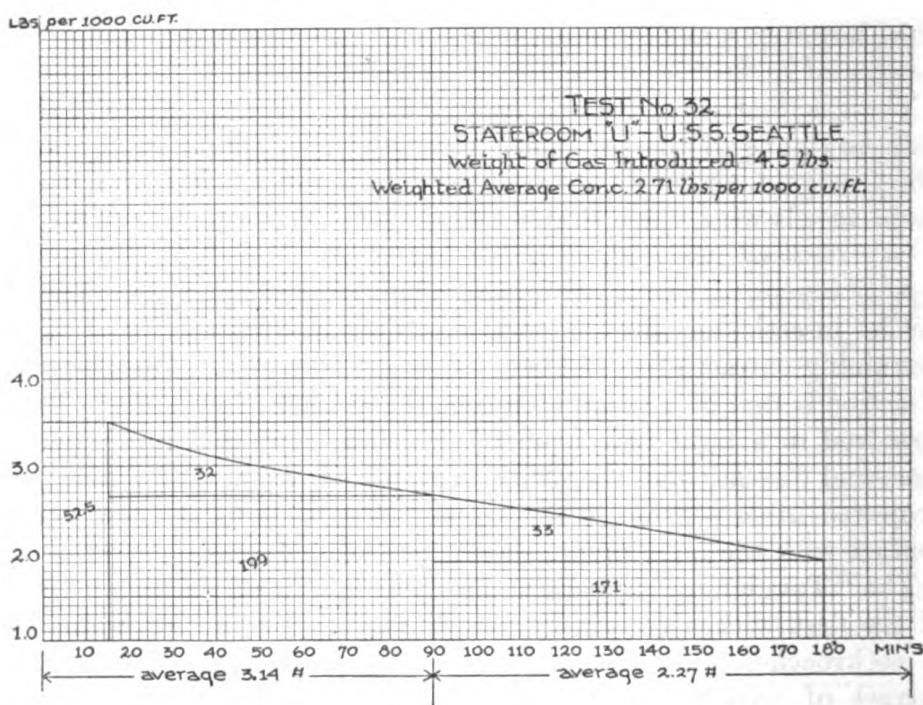
Test 1. Stateroom U of the *Seattle* was sealed as described on page 2, and 3 pill boxes with perforated covers containing 8 bedbugs each placed in the open on top of a writing desk. The "Vapora" apparatus was used, a concentration being set up of 4.1 ounces of "Vapora" liquid per 1,000 cubic feet, and the room closed for 3 hours. No immediate or ultimate effect was produced on the insects. The dosage used is prescribed by the manufacturer for bedbugs.



Test 2. The above was repeated with double the concentration or 8.2 ounces with negative results.

Test 3. This was conducted in a closed cabinet of 16 cubic foot capacity. The "Vapora" apparatus was started in operation and after a few minutes a similar pill box containing 8 bedbugs was placed directly in the spray for 15 minutes at a distance of 18 inches from the nozzle, the stream being directed against the side of the box and therefore passing over the top. The results again were negative.

Test 4. Two similar pill boxes containing 8 bedbugs each were placed in the center of a relatively airtight room of 324 cubic foot capacity; 1 box being contained in a wide-mouthed glass jar with a



section of muslin secured over the top; the other in the open. Both boxes were placed 3 feet from and 3 feet below the nozzle of a "Tanglefoot" apparatus which was started in operation and a concentration of 5 ounces per 1,000 cubic feet set up. The room was left sealed for 3 hours. No immediate or ultimate effect was produced upon the insects.

An initial concentration of 5.7 pounds of carboxide produced a complete ultimate kill of bedbugs in similar containers but placed in positions 2 and 3 which offered considerable resistance to penetration. The superiority of carboxide over the insecticide of apparatus of the above type where difficult penetration is required is therefore established.

## PART II—TESTS ON MERCHANT VESSELS

The tests on merchant vessels were conducted at New York, N.Y., in conjunction with the United States quarantine station of the Public Health Service. The object of this part of the research was to determine the efficiency of carboxide as an insecticidal fumigant under conditions of natural infestation. Merchant vessels presenting a marked degree of such infestation were selected by the Public Health Service authorities for this purpose and the fumigation carried out on the basis of the findings with naval vessels under conditions of artificial infestation as outlined in part I. The technique of special means of closure and the introduction of the carboxide was proceeded with as already described for naval vessels.

## DISCUSSION OF THE EXPERIMENTAL DATA

The tests were carried out on board the steamships *Cubano* and *Benedict*. The data are presented in table 5.

TABLE 5.—*Carboxide tests with bedbugs and cockroaches*

Test no.	Ship	Space	Cubical capacity	Added	Temperature average	Initial theoretical concentration
			<i>Cubic feet</i>	<i>Pounds</i>	<i>° F.</i>	<i>Pounds</i>
1.....	Cubano.....	Crew's quarters.....	15,000	120	78	8
2.....	do.....	Pantry and storeroom.....	2,000	12	74	6
3.....	do.....	Mess room.....	1,400	8	75	5.7
4.....	Benedict.....	Crew's quarters.....	13,100	68	60	5.2
5.....	do.....	do.....	13,100	68	70	5.2

Test no.	Initial actual concentration		Final concentration	Loss	Ultimate kill	
	Pounds	Minutes			Bedbugs	Cockroaches
			<i>Pounds</i>	<i>Percent</i>		
1.....					Complete.....	Complete.....
2.....	6.00	20	4.00	33 1/3	.....	Do.....
3.....	5.00	20	3.00	47	.....	Do.....
4.....	3.20	25	1.25	76	.....	Do.....
5.....	3.50	25	1.25	76	No insects.....	No insects.....

(a) *Tests aboard the steamship Cubano.*—This ship is a cargo type of Norwegian registry with a displacement of 5,800 gross tons. The experiments conducted will be described under the spaces designated. The exposure time for all tests with merchant vessels was 3 hours.

1. *Crew's quarters.*—This consists of a deck house aft containing two small washrooms, a small workshop, and a passageway connecting by a companionway to the second deck which in turn presents the following arrangement: On either side a passageway separated by a

partial bulkhead, each passageway connected forward with a mess room which is joined outboard to a bunk space. Each passageway opens outboard into three bunk spaces; a total therefore of 2 mess rooms and 8 bunk rooms. The combined cubical capacity of the above was 15,000 cubic feet.

It was necessary to seal 7 deck ventilators, 2 skylights, and 2 lateral doors. A portable motor blower ventilating set of a capacity of approximately 1,000 cubic feet per minute was installed at the head of the companionway, and the discharge directed downward into the two respective passageways below during the test. The release of 120 pounds of carboxide from two 60-pound cylinders was started and the doors sealed with a resulting initial concentration of 8 pounds. No analyses were made for carboxide in this test.

Preliminary inspection had revealed an excessively heavy infestation of cockroaches in practically all parts of the crew's quarters on the second deck, particularly on the surfaces of piping, the tops and interiors of lockers, and on bunk frames. A marked infestation of bedbugs was revealed in two bunk spaces readily detected on examination of the angles of the bunk frames and of the spring.

The lateral doors and all ventilators were opened at the end of the 3-hour exposure period at 4:30 p.m. and the space entered after 10 minutes, all airports being then opened. A slight odor of carboxide and a suggestion of irritation of the eyes were noted on entering, which disappeared within a few minutes. Clothes, mattresses, and bedding were not removed for airing. The bunks were occupied that night without any evidence of odor, irritation, or other discomfort.

The results were spectacular in the extreme. Enormous numbers—swarms in fact—of cockroaches were noted on the deck, particularly adjacent to bulkheads in the mess room. Large numbers were observed on the tops of lockers. The shelves of the lockers, all of which had been closed, presented large accumulations. Where only a few insects had been detected on a shelf prior to the test, one now noted large numbers. The vast majority were dead and those still alive in feeble or moribund condition.

The test showed conclusively that carboxide exerts a pronounced irritant action on cockroaches with the result that the insects leave their places of harborage and appear in the open. This appeared to be an initial effect of the gas as the number now in view was enormously greater than that observed prior to the test. It should be stated in this connection that the bulkheads are of wooden construction, made up of sections  $3\frac{1}{2}$  inches wide, the crevices between which afforded extensive harborage.

Large numbers of bedbugs were now found spread over blankets and mattresses whereas prior to the test they were largely confined



to the angles of the bunk frames. This also indicated an initial irritant action on bedbugs. In contrast to the cockroaches the majority were still alive although feeble.

On inspection the following morning at 9 a.m. all cockroaches and bedbugs were found to be dead. Six pieces of baggage, all of the suitcase type, which had been closed throughout the test were opened. Considerable numbers of dead cockroaches were found in every instance, demonstrating that the gas had penetrated the line of closure or the material itself or both of each suitcase sufficiently to set up a lethal concentration. A fuse box in a passageway closed during the run contained numerous specimens, all dead. An initial concentration of 8 pounds was adequate for a complete ultimate kill of all insects; in fact for a nearly complete immediate kill of cockroaches. It was concluded that a lower concentration would have proved effective for a complete ultimate kill.

2. *Pantry and storeroom.*—This arrangement consisted of a pantry in a deck house, connected by a hatchway to a provision storeroom below; the combined cubical air space being 2,000 cubic feet. Two ventilators and an entrance door required sealing. Ventilation was maintained by means of a portable motor-blower set of a capacity of 300 cubic feet per minute. This was placed just inside the door with a canvas discharge duct extending to a point 3 feet below the hatchway into the storeroom. Twelve pounds of carboxide were introduced setting up an initial concentration of 6 pounds.

Preliminary inspection revealed a wide distribution of cockroaches crawling on the overhead, over bulkheads, in lockers, in grain bins, and even in the refrigerator. At the conclusion of the test the door and the two air ports were quickly opened and the storeroom entered through the pantry after a lapse of 10 minutes. A slight odor of carboxide persisted in the storeroom but without irritation of the nose and throat. The picture now presented was striking. Immensely increased numbers of cockroaches had appeared on the bulkheads, deck, piping, and tops, as well as the interior of lockers. On raising the lids of two grain bins in the storeroom large numbers were noted on the surface, apparently having been forced out of the depths of the grain by the irritant action. The majority of the insects were alive but were generally in an enfeebled condition.

On inspection at 9 a.m. the following morning all insects had succumbed; this finding applying to the specimens in closed lockers, refrigerator, and a closed fuse box. The initial irritant effect observed in test 1 was confirmed. The loss of carboxide by analysis during the test was  $33\frac{1}{3}$  percent.

3. *Messroom.*—This consisted of an underofficers' messroom and a small adjoining pantry with a total cubical capacity of 1,400 cubic feet. Two ventilators and two doors necessitated sealing. Ventila-

tion was maintained by means of three 12-inch fans of the usual type. Eight pounds of carboxide were released with an initial concentration of 5.7 pounds.

Preliminary inspection revealed a moderate number of roaches, largely in the pantry; a few of the large or tropical type being included. The doors and air ports were opened at the end of the test and the space again entered at the end of 10 minutes. Practically no odor of carboxide could be detected. A definitely increased number of roaches was now found as compared with the preliminary condition, the irritant effect having brought the insects from harborage into the open. Practically all specimens were alive but definitely weakened as shown by inability to run rapidly when disturbed. On the following morning all insects were dead. The loss of carboxide during the run was 47 percent.

(b) *Tests aboard the steamship Benedict.*—This ship is a cargo type of British registry with a displacement of 4,920 gross tons.

1. *Crew's quarters.*—The location is on the second deck aft reached by a companionway. There are two messrooms forward on either side of the midline, each connected to a bunk space outboard. A passageway leads aft from each messroom connected in turn outboard on both sides with two bunk spaces and a sail room aft. Each bunk space contains four bunks. The combined cubical air space is 13,100 cubic feet.

Six ventilators, two skylights, and a set of double entrance doors at the head of the companionway were sealed. Ventilation was induced by means of 12-inch fans, 1 each being placed in 4 of the berthing spaces, in the messrooms, and at the foot of the companionway. Sixty-eight pounds of carboxide were released setting up an initial concentration of 5.2 pounds.

Preliminary inspection showed a very heavy infestation of cockroaches; in fact, nearly to the extent observed in the crew's quarters of the *Cubano*. The insects could be seen crawling generally over bunk frames, piping, bulkheads, and in mess and clothing lockers. No bedbugs were detected. The space was entered 5 minutes following the opening of the doors with practically no suggestion of odor of carboxide, due presumably to the high percentage of loss during the test, i.e., 76 percent. A tremendous change had occurred in the preliminary picture presented by the insects. Vast numbers had appeared on the overhead, piping, ledges, tops of lockers, and adjacent to the seams of the wooden bulkheads. This increase in the visible number of insects was most striking. As in the previous tests, they had emerged from harborage as a result of the irritant action of the fumigant. Practically all specimens were still alive, but in general a negative or merely feeble response was elicited when disturbed.

On the following morning at 8 a.m. the decks were littered with dead roaches incident to falling from the overhead, from piping, and from the bulkheads. No live specimens were found. Five suitcases closed during the tests were now opened, all revealing substantial numbers of dead roaches with none surviving. One closed fuse box contained dead insects. An initial concentration of approximately 5 pounds of carboxide was adequate to produce a complete ultimate kill despite a loss of 76 percent of the fumigant.

Test 5 was practically a repetition of test 4 with the exception that no insects were involved, the object being to check the factor of loss of the fumigant. The total loss was again found to be 76% and was considered to be chiefly due to leakage. All dead insects were carefully removed following test 4. No evidence of persisting infestation was found following test 5, thus indicating that the irritant action in the first instance had dislodged all live insects.

#### PART III—CARBOXIDE REQUIREMENTS FOR DIFFERENT CLASSES OF NAVAL VESSELS

It is recommended as a result of the tests of this research that 6 pounds of carboxide per 1,000 cubic feet be adopted as a general standard for insecticidal fumigation for a period of 3 hours, maximal access of the fumigant to all parts being provided; 6 pounds to also be the dosage for all spaces of less than 1,000 cubic feet. When the total volume is in excess of 1,000 cubic feet or of a multiple thereof, the fraction in excess, if less than 500 cubic feet, will be disregarded but will be counted as an additional 1,000 cubic feet if 500 cubic feet or greater. Thus a volume of 5,300 cubic feet would require 30 pounds and 5,500 cubic feet 36 pounds.

Carboxide is supplied by the Carbide & Carbon Chemicals Corporation in steel cylinders of four sizes containing 6, 12, 30, and 60 pounds of the gas respectively, as illustrated in the accompanying photograph. The respective weights of the empty cylinders are 41, 65, 115, and 130 pounds and the outside dimensions  $5\frac{5}{8}$  by  $28\frac{1}{8}$  inches,  $5\frac{5}{8}$  by  $45\frac{5}{8}$  inches,  $7\frac{3}{8}$  by  $48\frac{1}{4}$  inches, and  $9\frac{1}{8}$  by  $56\frac{1}{2}$  inches. It is advised that the 6- and 30-pound cylinders be adopted as standard units for naval application as these appear to satisfy all conditions. Any space or assemblage of spaces can be conveniently handled by using multiples of these two sizes and the necessity of measuring apparatus thereby obviated. The present cost of carboxide in the 6- and 30-pound cylinders in ton lots on the basis of free rental of containers for 90 days approximates 15 cents per pound; in carload lots 13 cents per pound.

The simplicity of employing these two sizes of cylinders on naval vessels up to the maximum space considered of 61,500 cubic feet is

exemplified in table 6. The data for cubical capacities have been supplied by the Bureau of Construction and Repair for the representative vessels indicated for the classes of battleships, light cruisers, destroyers, and submarines. The cost is taken as 15 cents per pound.

TABLE 6.—*Carboxide requirements for different classes of ships*

## BATTLESHIP (U.S.S. "MISSISSIPPI")

Space	Cubical capacity (cubic feet)	Pounds required	Number of 6-pound cylinders	Number of 30-pound cylinders	Cost
Sick bay.....	6,530	42	2	1	\$6.30
Staterooms:					
Minimum.....	720	6	1	-----	.90
Maximum.....	1,320	6	1	-----	.90
Chief petty officers' berthing space.....	7,900	48	3	1	7.20
Crew's berthing space:					
Minimum.....	7,200	42	2	1	6.30
Maximum.....	61,500	372	2	12	55.80
Pantries:					
Minimum.....	600	6	1	-----	.90
Maximum.....	2,250	12	2	-----	1.80
Galleys:					
Minimum.....	1,350	6	1	-----	.90
Maximum.....	6,275	36	1	1	5.40

## LIGHT CRUISER (U.S.S. "NORTHAMPTON")

Sick bay.....	2,900	18	3	-----	\$2.70
Staterooms:					
Minimum.....	650	6	1	-----	.90
Maximum.....	1,110	6	1	-----	.90
Chief petty officers' berthing space.....	5,200	30	-----	1	4.50
Crew's berthing space:					
Minimum.....	7,520	48	3	1	7.20
Maximum.....	27,725	168	3	5	25.20
Pantries:					
Minimum.....	700	6	1	-----	.90
Maximum.....	1,000	6	1	-----	.90
Galleys:					
Minimum.....	1,350	6	1	-----	.90
Maximum.....	6,275	36	1	1	5.40

## DESTROYER (U.S.S. "ALDEN")

Staterooms:					
Minimum.....	440	6	1	-----	\$0.90
Maximum.....	540	6	1	-----	.90
Crew's berthing space:					
Minimum.....	1,080	6	1	-----	.90
Maximum.....	4,485	24	4	-----	3.60

## SUBMARINE (U.S.S. "DOLPHIN")

Crew's berthing space:					
Minimum.....	2,515	18	3	-----	\$2.70
Maximum.....	2,715	18	3	-----	2.70

Certain unusual situations may arise when it may be necessary to fumigate the personal effects of enlisted personnel for insects and yet not be expedient to unpack clothes bags, hammocks, and hand luggage for this purpose. This may occur in connection with the

transfer of such effects of the crew to a newly commissioned ship. Under these circumstances considerable resistance to penetration will be encountered and the standard concentration of 6 pounds will in all probability not be adequate. The most severe condition set up in the tests aboard naval vessels was in position 1. This required a dosage of 8.8 pounds for complete ultimate kill. In order to insure a sufficient safety margin a dosage of 12 pounds is recommended for crew's effects when it is impracticable to facilitate access of the fumigant by the free exposure of the contents to the gas.

#### PART IV—CARBOXIDE VERSUS HYDROCYANIC ACID GAS FUMIGATION

A comparison of the cost of carboxide versus hydrocyanic acid gas fumigation naturally presents itself. When vessels of the United States Navy are fumigated by the Public Health Service, the cost of the hydrocyanic acid gas only is charged against naval funds, the labor not being taken into account. The concentration of hydrocyanic acid prescribed by the Public Health Service for the fumigation of bedbugs and cockroaches for merchant and naval vessels is 10 ounces per 1,000 cubic feet. The cost of the gas is approximately 6 cents per ounce. The charge, therefore, for a naval vessel is 60 cents per 1,000 cubic feet while the cost for carboxide fumigation on the basis of 15 cents per pound would be 90 cents per 1,000 cubic feet or an increase of 50 percent. As already stated, this difference will be reduced if carboxide is ordered in carload lots.

It should be recalled in this connection that gaseous fumigation is no longer practiced as a sanitary measure for infectuous diseases except for the destruction of rodents in the control of plague and, in exceptional instances, for the extermination of mosquitoes as a disease prevention measure. The problem on naval vessels is ordinarily that of the extermination of insects as nuisances rather than as health hazards. It is considered that for this purpose carboxide can be handled by the ship's personnel, thus obviating the loss of time and interference with operating routine in turning over the vessel to the Public Health Service. The use of hydrocyanic acid gas aboard a naval vessel would be extremely hazardous unless handled by highly trained personnel.

The primary application of carboxide on board naval vessels is in the extermination of the bedbug. It is also adapted to the destruction of the cockroach in large infestation. The use of either sodium fluoride or roach food powder spread about is effective, particularly in pantries, when the number is not excessive, but is slow in action. Under conditions of a heavy and extensive infestation, carboxide presents the marked advantage of practically immediate and complete elimination of the insects.

The question of the comparative susceptibility of the adult bedbug and cockroach and the respective egg to carboxide was discussed in the previous paper (1). It has not yet been experimentally established that the minimum lethal dosage for the adult applies to the egg, although this is considered probable for the bedbug by the Bureau of Entomology of the United States Department of Agriculture.

#### SUMMARY

1. Tests were first conducted on naval vessels; i.e., U.S.S. *Seattle* and U.S.S. *Pensacola* to ascertain whether carboxide is economically practicable for the extermination of bedbugs and cockroaches in such spaces as staterooms, chief petty officers' berthing spaces, and chief petty officers' mess room in a period of 3 hours. Artificial infestation was established, the insects being contained in pill and powder boxes buried in such locations as the following: In the middle of a filled and closed laundry bag in the open; in the middle of a mass of clothing tightly packed in a closed drawer; in a locked suitcase at the bottom of a closed clothing locker. These locations involved tests of varying difficulty of penetration.

2. A technique for special closure of spaces was employed in order to retain an effective concentration of carboxide. This can be readily and quickly applied by the ship's personnel. Circulation of air was maintained in all tests.

3. The initial concentration adequate for a complete ultimate kill of both types of insects in staterooms was 5.7 pounds for moderate and 8.8 pounds for very severe requirements of penetration; in chief petty officers' berthing spaces, 7.5 pounds for the second condition; in a chief petty officers' mess room 6.5 pounds for the first and 10 pounds for the second condition.

4. The average percentage loss of carboxide from spaces sealed by the specific procedure was 60 percent for staterooms, 33 percent for chief petty officers' berthing spaces, and 34 percent for a chief petty officers' mess room; 20 tests with staterooms, 4 with chief petty officers' berthing spaces, and 3 with a chief petty officers' mess room having been conducted.

5. Tests were carried out aboard two merchant vessels in conjunction with the Public Health Service under conditions of natural infestation with the objective of confirming the results obtained with artificial infestation.

6. A pantry and storeroom combined and an officers' mess room of 1 vessel were fumigated and the crew's quarters of 2 vessels; all presenting a relatively heavy infestation of cockroaches although varying in degree. Bedbugs were included in one test. In the first experiment an initial concentration of 8 pounds produced a com-

plete ultimate kill of all cockroaches and bedbugs; in fact an immediate kill of the vast majority of the cockroaches. In the second and third tests initial concentrations of 6 and 5.7 pounds were adequate. In the fourth test 5.2 pounds proved to be effective. The percentage loss of carboxide was 76 percent from the crew's quarters, 33 $\frac{1}{3}$  percent from the pantry and storeroom, and 40 percent from the officers' mess room.

7. The spaces of both naval and merchant vessels in all instances were free from any objectionable residue of gas within 10 to 15 minutes after opening the doors, ports, and ventilators. It was not necessary to employ gas masks on opening these spaces. No special measures were utilized to aerate the contents beyond ordinary ventilation. No ill effects resulted in connection with any of the personnel.

8. A 6-pound concentration of carboxide for a fumigation period of 3 hours is considered to be adequate for naval vessels, due precautions being exercised to facilitate penetration to a maximum by the opening of lockers, drawers, luggage, etc., and the free exposure of bedding and clothing.

9. The nebulizing type of apparatus with the steam atomizing principle such as the "Tanglefoot" or "Vapora" equipment does not induce sufficient penetration to accomplish as effective extermination of bedbugs as carboxide.

10. The present cost of carboxide in 6- and 30-pound cylinders is approximately 13 cents in carload and 15 cents in ton lots.

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#### REFERENCES

1. Brown, E. W.: Carboxide: A New Insecticidal Fumigant for Bedbugs and Cockroaches. *Naval Medical Bulletin*, 31:253. July 1933.
2. Tomkins, S. S.: Gas Detection Instruments. *American Gas Association Monthly*, 15:511. December 1933.

## NUTRITION IN RELATION TO DENTAL DISEASE

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The nutritional needs of the body are very complex; in fact, there are over 35 recognized food essentials which must be ingested for the proper functioning of the body. In nutritional studies we are confronted with the surprising fact that an individual may appear to eat an adequacy of food and yet show evidence of malnutrition. In addition, malnutrition is no respecter of economic factors, as shown by the wide prevalence of dental caries among the children of the well-to-do. It is almost axiomatic that increasing degrees of health and vigor are attained by the individual who already appears well if the diet is made more complete in its various essential factors.

For many years the dental profession has accepted the theory that dental caries was dependent upon bacterial activity. However, as evidence accumulates there is a growing conviction that, while *B. acidophilus* may be the immediate exciting cause of dental caries, the factors of nutrition determine whether or not the field is favorable for bacterial growth (1, 2, 3)<sup>1</sup>. In other words, it appears that the presence of dental caries is in itself an indication of a metabolic disturbance (4, 5, 6).

This premise is fortified by clinical evidence accumulating from many workers, who have found that the incidence of caries decreases and even ceases when sound nutrition is established (3). In support, I will mention but two of the many institutions engaged in research on this subject—Johns Hopkins University and Columbia University, where dental caries has been produced at will in animal experimental work and, conversely, prevented, merely by dietary measures. To attempt to go into the details of even a small section of the vast amount of work reported in this field would be confusing. Suffice to say that while the results from animal experimental work are in some respects contradictory (7), the clinical results in institutions and in private practice (5) in employing dietary measures in the treatment of dental diseases have given sufficient evidence of its value. Why such treatment is successful is a technical question involving so many and so varied factors that it remains for biological chemists and those in allied sciences to determine what individual factor or factors are most responsible.

It is common knowledge that individuals of certain races on native diets have a high immunity to dental diseases, and that this immunity is lost when the dietary habits of civilization are adopted (4, 6).

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<sup>1</sup> Figures in parentheses indicate references cited.



Controlled feeding of children to observe dental relationship is in progress in the United States and Canada, and from England the work of May Mellanby (6) provides data which are of a convincing character. The results of Boyd and Drain (2) were pioneer in character and demonstrated that in from 8 to 10 weeks after the child had been placed on a strictly regulated diet the teeth were immune to decay as long as the prescribed regimen was followed. This was first noted on a group of diabetic children but the same results were obtained on children with other metabolic disorders, as well as on those children free from disease, upon a regular ingestion of a complete diet.

On every side we find inspired propaganda designed to exploit certain food products and other materials, but if the principles of nutrition were understood we could discharge our function as advisors in dental health and recommend inexpensive additions to the diet that are known to supply the food essentials which are deficient. The following food principles are the ones in which a deficiency is found in the average dietary:

Calcium

Phosphorus

Iron

Vitamins A, C, and D

The general appearance and feeling of well-being of an individual is no criterion that all is well from his nutritional standpoint. Experimental animal feeding demonstrates that a diet containing reduced amounts of essential food principles may produce animals not necessarily inferior in appearance to their mates receiving an adequate food supply, nevertheless, the resulting inferiority can be demonstrated in a number of ways, one of which is a decrease in longevity.

The methods used to insure a liberal intake of vitamins and minerals in clinical practice is to calculate from the diet the approximate intake, and suggest corrections or additions of minerals and vitamins to the desired amounts. For successful treatment it is essential to secure an adequate ingestion of the necessary vitamins and minerals. When these requirements have been fulfilled the appetite can be satisfied as desired. Starchy foods and sweets should be accessories rather than staple articles of diet, because they tend to crowd out a desire for the more valuable and essential foods.

As a general proposition, an adequate intake of milk supplemented with small doses of cod-liver oil in addition to a good general diet will be a step, and a large one, toward sound nutrition. Vitamin C is found in fresh fruits, and by ingesting orange or tomato juice in sufficient quantities daily an adequate intake of vitamin C can be

insured. Work at the Mooseheart Orphanage indicates that 3 ounces of orange juice daily is not sufficient to reduce the incidence of gingivitis or dental caries (8). Eight ounces daily is the amount advised in our work.

Dr. Percy Howe of Harvard University has made the pertinent statement that sound teeth usually accompany sound bodies.

Dr. Thaddeus P. Hyatt, before the midwinter meeting of the Greater New York Dental Society recently, reiterated the fact that "A clean tooth does not decay"; supported by his data from the examination of several millions of tooth surfaces. His research has shown the probabilities are 2,000 to 1 that pits and fissures will decay within 10 years. There is no question but that this is true, but we must remember that actual demonstrations as to what an adequate diet really is are only now being presented, and clinical results showing that such a diet does materially reduce the incidence of caries are only coming to notice. In other words, it is believed that the conclusions of Dr. Hyatt are correct when based upon the usual dietary, even one considered good for children, that includes daily:

1 quart of milk	½ pound of fruit
1½ ounces of butter	1 egg
1 pound of vegetables	Meat

These foods do not contain substances that are specifically antagonistic to gingivitis or dental caries. However, this same diet when supplemented with cod-liver oil and fruit juices was effective in arresting dental caries (3).

The mineral requirements of the body, insofar as they relate to calcium and phosphorus, may be met by taking from a pint to a quart of milk as a daily addition to the diet. Where this is not practicable or desirable, these minerals may be taken in the form of calcium phosphate. In this connection, McCollum (9) states "A simple way to supplement a diet poor in minerals is to take two level teaspoons of dicalcium phosphate each day. This will furnish about the same amount of calcium and phosphorus as a quart of milk and should be taken in addition to the regular diet." The usual diet contains about 7 grains of calcium and 13 grains of phosphorus which are inadequate amounts and should be augmented by milk or calcium phosphate together with some source of vitamin D, which is to be found in abundance in cod-liver oil.

May Mellanby, of Sheffield, England, has been engaged since 1917 in nutritional studies in connection with dental diseases. Her experimental work has embraced animals and children (6). The evidence she presents in the case of animals indicates that it is necessary to have adequate amounts of vitamins A and D to insure the formation of sound teeth and well-developed bone, and to maintain the in-

tegrity of the alveolar process and gums in later life. She has been able to induce pyorrhea in animals with a deficient intake of these vitamins during the development period, and conversely by liberal amounts of the vitamins A and D during the same period to raise animals which are free from the symptoms of this disease at a mature age. Her work on human beings indicates that dental conditions are similarly affected by an adequacy or inadequacy of vitamins as in the case of animals, and she found that the inclusion of cod liver oil in the dietary of children markedly reduced the incidence of dental caries.

Milk and cheese are the only foods containing appreciable amounts of calcium, while cod liver oil, or its concentrates, are our most reliable sources of vitamins A and D. Technical data have purposely been avoided as they are readily available in textbooks (10, 11) and periodicals (1, 4, 5, 6, 8, 12). A sad commentary on the diet of civilization is contained in a report of a survey of 4,600 children in New York in 1932. Ninety-seven and one half percent of these children had dental caries. Are they getting a fair start in life from a nutritional standpoint? It would appear not. In contrast to the foregoing, a dental survey of children on the Island of Tristan da Cunha (13) shows almost 100 percent freedom from dental caries. Their diet is conspicuous by the absence of cereals, flour, and sweets, the staple articles of food being milk, eggs, fish, and potatoes, which are high in calcium, phosphorus, carbohydrates and vitamins.

Jones, Larsen and Pritchard, *Dental Cosmos*, April 1934, report arrest of caries when carbohydrates forming an alkaline ash, such as potatoes and lima beans, are substituted for the acid ash producing grains like wheat and rice. Mellanby (6) found an anticalcifying factor in grains which she calls toxamin.

#### CONCLUSION

To the professional eye, missing teeth do not mean merely so many vacant spaces to be filled, these spaces have a much more profound significance. It is the consensus of opinion that dental caries which is the principal cause of the loss of teeth in youth or young adulthood is a local manifestation of general malnutrition or of a metabolic disturbance. It so happens that dental caries may be the only visible evidence of nutritional imbalance, and it is only reasonable to suppose that other body tissues are also affected and hence less resistant to disease. The picture presented by the dental condition thus portrays to the critical observer the fundamental as to whether the body has been or is receiving a balanced nutrition without which abundant health and vigor do not exist.

## BIBLIOGRAPHY

1. Boyd, J. D., Zentmire, Z., and Drain, C. L.: Bacteriological Studies in Dental Caries, Jour. D. Res. Vol. XIII, 443, December 1933.
2. Boyd, J. D., and Drain, C. L.: The Arrest of Dental Caries in Childhood. Jour. A.M.A. 90; 1867, June 1928.
3. Boyd, J. D.: Teeth and the Diet. Inter. Jour. Ortho. and Dent. for Chil. Vol. XIX; 1254, December 1933.
4. Price, Weston A.: Why Dental Caries with Modern Civilization? Dental Digest, March et seq. 1933.
5. Jennings, J. K.: Nutrition in Dentistry, Dental Survey, July et seq. 1933.
6. Mellanby, May: Diet and the Teeth, Part II. Special Report Series No. 153, Privy Council, Medical Research Council, London, England, 1930. (Part III, No. 191, 1934.)
7. Shelling, H. D., and Asher, D. E.: Calcium and Phosphorus Studies, Jour. Dent. Res. Vol. XIII; 363, October 1933.
8. Hanke, Milton T.: Diet and Dental Health. University of Chicago Press, 1933.
9. McCollum, E. V.: Every Tooth Sound. McCall's Magazine. May 1932.
10. Sherman, H. C.: Chemistry of Food and Nutrition. Third edition 1928.
11. McCollum, E. V., and Simmons, Nina: Newer Knowledge of Nutrition. Fourth edition, 1929.
12. Davis, S. L.: Dental Caries. The Pacific Dental Gazette. September 1930.
13. Bee, A. B.: Tristan da Cunha: Visit of H.M.S. *Carlisle*, January 1922. Jour. Royal Nav. Med. Service 173. Vol. XVIII, July 1932.

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MALIGNANT NEUTROPENIA WITH CASE REPORTS

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When we consider that all of the cellular elements of the blood, with the exception of the lymphocytes, are derived from the bone marrow in the adult, the importance of the marrow becomes that of an organ, the blood that of a tissue, and, according to Sabin (1), should be so considered.

As clinicians we are fully aware of the normal and abnormal variations in the qualitative and quantitative changes in the corpuscular elements of the blood and have associated these changes as leucocytosis, leucopenia, anemia, for example, with various clinical syndromes and entities. How frequently have we noted leucopenia, for example, and have used such a finding in the differential diagnosis of typhoid fever and other conditions known to be associated with a low total white count due to a diminution of the polymorphonuclear neutrophils in the peripheral circulation.

While such a finding as ordinary leucopenia associated with some infectious disease must be sharply differentiated from chronic and malignant neutropenia, about to be described, yet only in the past few years has the attention been focused on the bone marrow as being most probably of primary importance in some of these neutropenic

or leucopenic states and associated with clinical syndromes which are now assuming the rank of clinical entities.

Without going into the theories of the origin and maturation of the blood's cellular constituents it is generally agreed that the marrow produces all of these cells, with the exception of the lymphocytes and possibly of the monocytes. For our purpose these cells consist of three groups:

1. The erythrocytes or red blood cells;
2. The polymorphonuclear leucocytes, or granulocytes; and
3. The thrombocytes or blood platelets.

That the hematopoietic function of the bone marrow may be depressed by various agents has been known for some time, and either a part or the whole of this function may be depressed or abolished, acutely or chronically, temporarily or permanently. If the formation of red cells alone is depressed, nonregenerative anemia results; if the platelets alone fail to generate, the syndrome of hemorrhagic purpura or thrombocytopenia ensues; if the marrow function in toto is abolished, the result is aplastic anemia; but if only the formation of the myeloid cells or granulocytes is depressed, the term granulocytopenia or neutropenia is commonly used. It must be remembered, however, that two or more of these hematopoietic functions may be impaired simultaneously, but usually not to the same degree except in aplastic anemia. Thus in malignant neutropenia there may be an associated anemia of moderate degree.

Among the more important bone marrow depressants so far discovered may be mentioned benzol, or substances containing the benzol ring (e.g. arsphenamine), (2), X-rays, the gamma rays of radium, thorium, trinitrotoluene, and severe infections, though no specific bacterial toxins are proved to have this effect. Also the leukemias and neoplastic invasion of the marrow may by their destructive action cause similar changes in the peripheral blood. Just why these various etiologic agents will in one person depress the leucoblastic function of the marrow and have some other effect in another person is not definitely known, but in the case of the arsphenamines, at least, the amount and the duration of the toxic influence on the marrow seem to be the deciding point; so that anything from the relatively mild thrombocytopenia to the severe and usually fatal aplastic anemia may be had. Likewise the inherent ability of the bone marrow to respond to depressants seems, at the present time, to be a factor of considerable importance. McCarthy and Wilson (3) believe that thrombocytopenia in arsenical poisoning is due to a peripheral destructive action on the blood platelets, but that neutropenia and aplastic anemia are due to bone marrow depression. Inorganic arsenic seems to play an insignificant role, if any, on

bone marrow function, and Wheelihan (4) has reported the only case in the literature of neutropenia following the use of an inorganic arsenical, and the etiology in this case was somewhat questionable.

In regard to neutropenia, the subject of this discussion, it was Schultz (5), in 1922, who made the first clear-cut description of a case "characterized by a necrotizing infection of the throat, extreme weakness bordering on almost complete prostration, fever, some jaundice, occasional purpura, and a blood picture of leucopenia, total absence of granulocytes, and finally a rapid down-hill course with a fatal termination." Schultz (6) called this disease "angina agranulocytica" which is now considered to be only a form of malignant neutropenia.

Since the time of Schultz' description in 1922 at least 500 cases have been reported, and it is believed by Doan that the disease is actually on the increase and that this large number of cases is not due to a mere enhancement of our diagnostic acumen. Various workers have used different terms for this condition among which may be mentioned angina agranulocytica, agranulocytic angina, agranulocytosis, neutropenia, malignant neutropenia, granulocytopenia, and mucositis necroticans agranulocytica. Kracke (7, 8) of Emory University, an authority on the blood dyscrasias, states that the term granulocytopenia best describes the condition. Doan (9), however, also an authority on this condition, uses the term neutropenia and subdivides it into chronic neutropenia and malignant neutropenia, the latter term being suggested by Schilling (10).

*Chronic neutropenia.*—There is a small group of apparently normal individuals who persistently have a neutropenia or a total white blood count of 5,000 or below due to a reduction in the number of granulocytes. These people are in good health, respond normally to infection, and apparently do not in any way belong to the pathological grouping of neutropenia. There is another similar group, however, of chronic neutropenic individuals in whom there is frequently a loss of the sense of well being, loss of energy, abnormal fatigability, a relative lymphocytosis, and a mild shift to the left. Any condition, as an acute infection in these people, calling for more than the usual physiological demands upon the bone marrow, results in a still more marked neutropenia rather than a leucocytosis. The chronic neutropenic, then, loses his normal defense against infection when it is most needed, the infection depresses the marrow still more, so that a vicious circle is formed, and the patient rapidly passes into the malignant type of neutropenia. In such cases the sense of well being is often directly proportional to the total white count. Just why these persons begin with

a chronic insufficiency of the bone marrow is not always clear unless some specific toxic agent previously mentioned can explain it. Dennis (11) is of the opinion that a chronic focal infection is responsible for this primary bone marrow depression and offers experimental evidence to support his view. Kracke regards the condition as a primary marrow dysfunction predisposing the individual to the onslaughts of bacteria which cause further marrow depression, and he has produced the condition experimentally in animals, and has been unable to find a toxic substances in the blood of his cases or to transmit the disease. He has also noted in clinical cases the drop in the white count before the loss of the sense of well being and prior to throat or other infection.

*Malignant neutropenia.*—This is the acute stage. It may develop from the chronic stage due to an infection, primarily from a severe infection, some chronic toxic agent, or, on the other hand, it may be that the neutropenia itself, by lowering the body's resistance, invites infection. In a given case the etiology is not always clear. The syndrome of Schultz, already mentioned, adequately describes malignant neutropenia. Instead of the sore throat, which is common, there may be other infections as sinusitis, osteomyelitis, or no infection at all. The condition is one of extreme prostration and out of all proportion to the apparent severity of the pathological clinical findings. The usual symptoms of infection are added to the clinical picture. The granulocytes of the blood show a persistent drop, the lymphocytes and monocytes diminish also, so that a total white count of 1,000 or much less is common, and, at times, with a total absence of granulocytes. While spontaneous recoveries occasionally occur in the malignant form, as a rule the patient will die unless the condition is quickly recognized and appropriate treatment instituted at once.

The diagnosis depends upon the hematologist who is also just as important as a guide to treatment by reason of his repeated blood examinations. Clinically the disease should be suspicioned and appropriate laboratory requests made if the following criteria, taken from Doan, are found:

1. A history which reveals vague symptoms of fatigue and weakness preceding any signs of infection, thus marking the neutropenia as primary;
2. The rapid malignant spread of what would ordinarily prove to be a minor infection of the mouth;
3. The severity of the general prostration and malaise and by a degree of apprehension out of all proportion to the extent and duration of the infection or of the pathogenicity of the organisms found, as the *B. subtilus*, Vincent's organisms, or the *B. pyocyaneus*.

**Pathologically** the bone marrow in these cases may be relatively aplastic or even hyperplastic, and the neutropenia of the blood in the presence of a hyperplastic bone marrow is explained by the depression or paralysis of the leucoplastic maturation and liberation of granulocytes.

**Prognosis.**—Malignant neutropenia has been extremely fatal prior to the introduction of the newer forms of treatment, especially the nucleic acid degradation products (adenine and guanine). Mortality figures of 90 percent were reported. In those who recover, relapses are frequent and usually so within a few months, though remissions have been known to last for a period of 2 years. The lowness of the total count seems to affect the prognosis very little when the appropriate treatment is used.

**Treatment.**—In addition to special nursing care, meticulous search for and treatment of infections, and symptomatic treatment, three chief lines of more or less specific therapeutic aids have been developed; namely, X-ray therapy, transfusions, and the use of nucleic acid derivations, especially Pentose Nucleotide (K 96) as prepared by Smith, Kline, & French Co., Philadelphia.

1. X-ray therapy was advocated by Friedmann (12), but his mortality was 66 percent, and other forms of treatment are believed to be superior to radiotherapy.

2. Blood transfusions have met with considerable success and seem to prove beneficial chiefly through the content of granulocytes and the small amount of pentose nucleotide which was first found by Jackson (13) to be present in normal blood. Later work by Doan and his associates has shown that pentose nucleotide stimulates the maturation and liberation of granulocytes and that this substance is most likely the normal stimulus for the leucoblastic tissue of the bone marrow. While blood transfusions have been beneficial, the chief disadvantage is the low content of pentose nucleotide in normal blood. Fisher (14) was the first to use a convalescent patient as a donor and with favorable results hardly short of miraculous. The scarcity of convalescent donors, however, renders this method of little avail.

3. With the advent of pentose nucleotide therapy as advocated by Doan and his coworkers, the mortality in a series of cases reported by Jackson, Parker, and Taylor (15, 16) of Boston was only 26 percent. By supplying in large quantity the normal pentose nucleotide of the blood a powerful stimulus is given the bone marrow which responds by increased hyperplasia, maturation, and liberation of the granulocytes. Thus, by increasing the patient's resistance, his sense of well-being improves and the existing infection subsides. The preparation is given in solution, 0.7 gram to 10 cubic centimeters intramuscularly, twice daily, until a response is definitely seen in the



peripheral blood, and then the preparation is discontinued until it appears necessary to repeat it. No granulocytic response is usually seen, however, until about the fifth day of treatment.

It is believed that the beneficial effect of X-ray therapy is really based upon the same mechanism as a nucleotide therapy in that the destructive action of the X-rays should liberate pentose nucleotide from the leucoblastic tissue of the marrow.

*Case 1.*—D. R., a white male, age 30, was admitted November 25, 1932, and was observed in the hospital over a period of 9 months. Several weeks prior to admission patient had scratched the back of his left hand which failed to heal. For 6 days, prior to admission, the patient did not feel well but continued his work. Three days prior to admission there were daily chills and fever and a tender mass in the left axilla. Examination showed an acutely ill white male, 30 years of age, with an occasional chill and running a septic type of fever which continued for 3 weeks, general lymphadenopathy with acute lymphadenitis in the left axilla, two nonpurulent papules on the back of the left hand, slight icterus, albuminuria, hematuria, and hemoglobinuria, two suspicious teeth which were extracted, a positive indirect Van den Bergh, icterous index of 30, and the general picture being that of a septicemia with a hemolytic jaundice. Blood cultures, however, were repeatedly negative as well as agglutination tests for specific organisms as the *B. tularensis*. From our point of view the most significant finding was a progressive neutropenia and associated with a moderate secondary anemia. The platelets were not affected. On admission the white blood cells was 3,300 with 44 percent granulocytes. During the next 15 days the white count gradually dropped to 1,000 with 54 percent granulocytes, and, at various times, it was difficult to find granulocytes at all. The treatment consisted of blood transfusions, pentose nucleotide, liver extract, and general symptomatic measures, but, in the light of present knowledge, the nucleotide was not given as vigorously as would be desired. There was gradual but no spectacular improvement, and the patient was finally discharged from the service feeling well, except for some weakness, but with a blood picture that of the chronic neutropenic state. Shortly before discharge the white blood cells were 3,000 with 36 percent granulocytes, though, on several occasions, the counts approached or reached the lower limits of normal.

*Discussion.*—This case would seem to be one of malignant neutropenia, possibly developing from the chronic stage as a result of a severe infection, the exact nature of which infection was not determined. Over a period of 9 months, though in fair health after the acute illness, the blood never improved beyond the chronic neutropenic state.

*Case 2.*—R. C. B., a white male, 44 years of age. In 1918 he was surveyed from the Marine Corps because of chronic gastritis. Since 1918 he has frequently suffered from vague digestive disturbances and had been treated at various times for chronic gastritis, duodenal ulcer, chronic cholecystitis, and gall stones. The tonsils were removed in 1928 because of repeated attacks of acute tonsillitis. In 1929 he was treated in the Norfolk Naval Hospital for chronic cholecystitis and duodenal ulcer, and was symptom free on discharge, but the diagnosis of duodenal ulcer was not confirmed by X-ray, while a gall bladder X-ray series failed to visualize the gall bladder. On December 3, 1932, the patient was again admitted suffering from symptoms suggestive of gall stone colic. There was a slight jaundice and a fever of 100 on admission. By the time of admission the symptoms were not severe, the fever subsided in a

day or two, and the physical examination revealed little other than a slight jaundice and some tenderness in the gall bladder area. A gall bladder X-ray series failed to show stones. On December 10 the patient became febrile again and had signs of a left-sided pleurisy. Vague symptoms of indigestion continued, and occasional upper right quadrant pain was complained of. The blood count showed a moderate anemia and a white blood count of 3,300 with 75 percent lymphocytes. There was a shift to the left. Various measures to build up the patient's general condition and blood were instituted; such measures as transfusions, nucleotide injections, iron, liver extract, and diet, but without beneficial results. His general condition rapidly and progressively grew worse, and the blood picture gradually assumed that of an aplastic anemia with the exception of the fact that there was evidence of red blood regeneration. The white count dropped to 340, the red cells to less than 2,000,000 in spite of transfusions, the platelets to 7,000, and various spontaneous hemorrhages developed from the lungs, G.I. tract, and into the skin. The blood picture so nearly approached that of an aplastic anemia that the condition was considered as such for a time. The lymphocytes, however, were of the immature type, and a general lymphadenopathy with enlargement of the spleen developed. The patient died on February 25, 1933. An autopsy showed a fibrous constriction of the cystic duct with hydrops of the gall bladder, acute passive congestion of the lungs and liver, parenchymatous degeneration of the heart, liver, kidneys, adrenals, and sections of the lymph glands showed lymphatic leukemia. The bone marrow was packed by these lymphoid cells.

*Discussion.*—It would appear that this was a case of lymphatic leukemia from the beginning of his last illness and that the crowding of the bone marrow by lymphocytes was in large measure the cause of the blood findings. Such a condition is sometimes spoken of as aplastic anemia of the myelophthisic type.

*Case 3.*—J. W. E., white male, aged 23, was admitted on November 16, 1933, with diagnosis of tonsillitis, acute. Previous health had been excellent until onset of sore throat and fever about 2 days prior to admission. Examination revealed a well-developed young white male suffering from what appeared to be an ordinary acute tonsillitis and treatment accordingly was instituted. There was edema of the peritonsillar tissues and of the uvula, however, and a general lymphadenopathy with a palpable spleen was present. At first little attention was given the lymphadenopathy so far as his acute illness was concerned. The next day there was considerable prostration, the throat condition was worse, there was a grayish exudate in the crypts of the tonsils, and there was a dirty ulcer the size of a dime on the right tonsil. The second day of the illness showed no improvement in the general condition, and there was an extension of the membrane and edema of the peritonsillar tissues. Two injections of 10,000 units of diphtheria antitoxin were given without benefit. Throat cultures were negative for specific organisms. The blood count made on the day after admission showed the following: Red blood cell, 3,120,000; hemoglobin, 75 percent; white blood cell, 1,500; with 86 percent lymphocytes and only 12 percent granuleocytes. The case was then considered typical agranulocytic angina, or one of the forms of malignant neutropenia. Blood transfusions and pentose nucleotide were started and with very striking improvement. Three weeks after admission the patient seemed to have recovered from the acute illness, the throat was well, he felt well and was up and about. The white count at this time was 4,350 with 56 percent granulocytes, though it had fallen to as low as 250 cells before improvement began. By December 26 the entire blood picture was essentially normal. The lymphadenopathy noted on admission, however, persisted, and the various glands gradually became large and somewhat painful. The spleen then enlarged, and the liver

was palpable. On January 2, 1934, the white blood cell was 14,000 and on the third, 18,650. Differential showed myelocytes, 1; juveniles, 9; bands, 23; segmentals, 31; lymphocytes, 21; monocytes, 3; lymphoblasts, 2; and normoblasts, 1.

On February 2 a biopsy was done on a lymph gland which showed lymphatic leukemia. On February 6 a biopsy was done on the bone marrow which also showed lymphatic leukemia and the myeloid cells largely replaced by lymphocytes. At present the patient is gradually becoming weaker, the lymphatic glands are increasing in size, epistaxis is frequent, and a blood count done today showed red blood cell, 3,400,000; hemoglobin, 70 percent, white blood cell, 2,250, with 13 percent granulocytes, and 87 percent nongranulocytes; platelets, 108,800.

*Discussion*—This case was apparently one of malignant neutropenia in the beginning and making a beautiful recovery. It is also believed that lymphatic leukemia existed on admission, but the connection of the two conditions is not clear. Various possibilities might be considered.

#### BIBLIOGRAPHY

1. Sabin, F. R., and Doan, C. A.: Bone Marrow as an Organ. *Proc. Soc. Exper. Biol. and Med.*, 1925.
2. Mink, O. J., and Campbell, H. D.: Toxic Effects of Arsenical Compounds Employed in the Treatment of Syphilis in the United States Navy, 1931. *U.S. Naval Med. Bull.*, April 1933, pp. 177.
3. McCarthy, F. P., and Wilson, R., Jr.: The Blood Dyscrasias Following the Arspenamines. *J.A.M.A.*, November 5, 1932.
4. Wheelihan, R. Y.: Granulocytic Aplasia of the Bone Marrow Following the Use of Arsenic. *Amer. J. Dis. Child.*, June 1928.
5. Schultz, W.: Ueber eigenartige Halserkrankungen (a) Monozytenangina (b) Gangranes zurcinde Prozesse und Defekt des Granulozytenisystems. *Deutsche Med. Wchnschr.*, 48: 1495-1496, 1922.
6. Symposium Section: Agranulocytic Angina. *Inter. Med. Digest*, September 1933, p. 180.
7. Kracke, R. R.: Review of Granulocytopenia (Agranulocytosis). *Jour. Lab. & Clin. Med.*, July 1932.
8. Kracke, R. R.: Experimental Production of Agranulocytosis. *Amer. Jour. Clin. Path.*, January 1932.
9. Doan, C. A.: The Neutropenic State: Its Significance and Therapeutic Rationale. *J.A.M.A.*, July 16, 1932.
10. Schilling, V.: The Blood Picture. Ed. 1, St. Louis, the C. V. Mosby Co., pp. 134-195, 1929.
11. Dennis, E. W.: Experimental Granulopenia Due to Bacterial Toxins Elaborated in Vivo. *J. Exper. Med.*, June 1933.
12. Friedmann, U.: Agranulocytic Angina. *Zitsch f. Klin. Med.*, 1928.
13. Jackson, H., Jr.: Studies in Nuclein Metabolism; Isolation of a Nucleotide from Human Blood. *J. Biol. Chem.*, April 1924.
14. Fisher, R. L.: A Case of Agranulocytic Angina Successfully Treated with Immuno-transfusion. *Jour. Mich. Med. Soc.*, June 1930.
15. Jackson, H., Jr., Parker F., Jr., and Taylor, F. H. L.: Studies of Diseases of the Lymphoid and Myeloid Tissues; The Nucleotide Therapy of Agranulocytic Angina, Malignant Neutropenia, and Allied Conditions. *Amer. Jour. Med. Sciences*, September 1932.
16. Jackson, H., Jr., Parker, F., Jr., Rhinehart, J. F., and Taylor, F. H. L.: Studies of Diseases of the Lymphoid and Myeloid Tissues; Treatment of Malignant Neutropenia with Pentose Nucleotide. *J.A.M.A.*, November 14, 1931.

**INJURIES OF THE HEAD AND SPINE**

By KENNETH E. LOWMAN, Lieutenant Commander, Medical Corps, United States Navy

In discussing the subject of head injuries we always find a very interesting problem as to what to do in the diagnosis and treatment of these cases. At the Massachusetts General Hospital lumbar puncture has been employed as a diagnostic procedure in about 60 percent of the cases, and it has also been employed as one of the methods of therapeusis. The characteristic symptoms of head injuries such as dizziness, headache, abnormal behavior, and the like, are too numerous to mention. Our chief problem is to figure out more or less exactly what change has taken place in the condition of the cranial contents; the extent of the injury, its type and location; whether or not there is increased intracranial pressure.

We get the history of the case if possible from the patient, how he was hurt, and if he had been rendered unconscious or not. We should note if he is in a drowsy state, and be sure to take his pulse, respiration, and blood pressure. If there be compression interfering with the higher nerve centers, there usually is as a result some degree of loss of consciousness.

Usually in head injuries there is a certain degree of shock. If there be shock we get the signs of this condition, such as low blood pressure, elevated or slow pulse, subnormal temperature perhaps, etc. We practically always have bradycardia; the respirations may be altered, slow and shallow, sighing; or even worse, rapid, irregular, and stertorous. Then we know there is medullary damage present. Always in head injuries take blood pressure readings at regular and frequent intervals.

Neurological examination must be performed, carefully and at regular intervals. This means testing all the cranial nerves insofar as you can, examining the eye grounds, thereby possibly seeing hemorrhage in the retina or enlarged and tortuous vessels. We can tell by these means usually the extent of the injury.

Then we proceed to estimate the degree of increased intracranial pressure by lumbar puncture and the use of the spinal watermanometer. Increased intracranial pressure does do harm and we wish to reduce this pressure as soon as possible. We may warn you that when you do a spinal puncture you should always have a manometer at hand. The watermanometer's usual normal reading is about 150 millimeters; 250 millimeters is quite abnormal.

Therapeutically lumbar puncture is used to bring down intracranial pressure though any operation in many cases is fatal. We have a patient with increased intracranial pressure who must be decompressed somehow. Do so by lumbar puncture, but do not do so very quickly. The pressure should be lowered slowly and gradu-

ally. It is necessary, therefore, to tap the spine again at frequent intervals, using these taps continuously until the pressure becomes normal and remains normal.

The amount of fluid taken out in these cases is no index if the pressure is the same. Tap as often as indicated. Lumbar puncture is very valuable therapeutically, but is not all-curative. We have at times to use hypertonic solution of magnesium sulphate by rectum or by mouth in 25 or 50 percent solutions. This reduces edema of the brain and other viscera by the process of osmosis. Thus you are draining the system in two different ways, one by spinal tap and the other by hypertonic solutions.

Ventricular puncture is practically never done. When you have a compound fracture of the skull you operate as soon as the patient is out of shock. In most instances these cases are associated with extensive comminution. The part must be cleansed, debridement done, the depression properly treated, in which treatment we do not remove any large particles of bone but rather we try to replace them insofar as is possible. Always cleanse the dura mater and the brain substance beneath the clot. Be very aseptic with the work, close the wound as tightly as possible, and drain only if you have to do so.

A single depressed fracture usually calls for operation, but there is no hurry as a rule. In some cases we never have to operate. Operation is performed by trephining at the edge of the wound, raising the bone and exploring underneath it.

Intradural middle meningeal hemorrhage has its classic signs and classic treatment. Cerebrospinal fluid in extradural middle meningeal hemorrhage may be clear with high pressure. When doing a subtemporal decompression always take out the extradural clot and go on until the site of bleeding is found and methods instituted to stop the hemorrhage.

Subdural hematomata call for operation also. Rather frequently what may only be seemingly a slight head injury, turns out to be one where the patient does not return to normal and even paralytical changes develop. In these cases the clot is usually found accumulated between the dura and the arachnoid, causing possibly dizziness and blindness. Lumbar puncture shows increased pressure with the fluid either clear or yellowish. This type of subdural hemorrhage tends to get worse. Here we must do a real bone flap operation and in so doing always use a big flap. The clot may be jelly-like in consistency or may be the spread-out pancake type.

We have also a fairly large number of fractures of the occipital bone involving the foramen. These cases are important and should receive very careful attention. In looking at an X-ray of the skull be sure to examine every inch of this bony box. It is necessary to be

careful to have the patient in the proper position to take a good X-ray picture of the occipital bone and the foramen magnum; this picture being taken at such an angle as to show at the same time the occipital bone along with one or more of the vertebrae.

Errors of diagnosis of skull fractures may be made by mistaking suture lines, etc., for fractures, especially in young children. Occasionally a suture line occurs in the skull right down the middle of the frontal bone.

In conclusion of our discussion of injuries of the head, remember always in the diagnosis of cranial injuries to use the ophthalmoscope to see if there be any hemorrhage or other change in the retina, a very important sign. Remember the spinal fluid pressure; we use the spinal manometer which can connect directly with the spinal needle and give a resulting easy reading. Be sure to always withdraw the spinal fluid slowly. In all spinal cord and cranial injuries you need a spinal needle.

In dealing with the skull in head injuries the following instruments are very essential: The Hudson drill, rongeurs, a proper spoon to hold the brain away from the dura, and a fine hook to pick up the dura; also electrosurgical apparatus is a fine adjunct. In dealing with the exposed brain never use dry gauze, but rather wet pledgets of cotton. As a rule we do not have to tap the ventricles, but a ventricular needle should be handy. Some people employ dura clips, but we do not think them necessary. Of course we must have a certain number of fine silk sutures on curved needles.

Now we will consider injuries to the cervical spine. In the treatment of this subject we must remember that the atlas has neither body nor spinous process, but the axis has a very long spinous process. The anterior part of the atlas may be palpated through the mouth in the posterior nasopharynx. Pain is at times a symptom of fractures of the cervical spine, with also possibly some bleeding and edema. It is a good point to remember in examining patients for possible injuries to the cervical spine that we should always stand behind them and hold the head beneath the jaws and move gently in order to help us to arrive at our diagnosis. The treatment is as that of any other fracture, reduction and fixation. The patient is placed in bed on a Bradford frame, fixation is obtained by a plaster jacket down to the hips, and then a helmetlike plaster around the neck and head open over the throat. Other mechanical methods may be used if you wish. The simplest fracture in this type of injury is that of the spinous processes of the cervical vertebrae.

Now as regards fractures of the axis. We treat this by placing in a plaster for a period of 8 weeks; then 12 weeks in a leather jacket; then the Thomas collar for a varying period of time. Bony union is

here exceedingly slow and it is common to get malunion or no union at all. Compression fractures of the bodies of any of the cervical vertebrae are treated by hyperextension as in fracture of the lower spine.

Dislocation of the atlas or axis is possible without fracture. The diagnosis is made by getting a complete history of the injury, by the presence of pain, stiffness, and the position in which the head is usually held. Tenderness may be present and the head is generally rotated away from the side on which the injury is present. Remember that a bilateral dislocation of either the atlas or the axis would drop the head forward.

Treatment of this unusual clinical entity is to reduce the dislocation immediately and place in fixation. In order to do this we must have deep anesthesia and a sling is placed around the patient's head beneath the chin and around the surgeon's waist. Then the head is turned to either side, extension is applied and the head allowed to return to the midline and placed in traction in fixation. Operation is seldom if ever indicated.

The treatment of fractures of the transverse processes of the vertebrae should not be overdone, as they are really not very important. Strap the back of the patient who is in bed and remains therein for a week or two. Then allow him up with a belt to be worn until he is alright again. At times these cases may have a good deal of pain but are usually back to work in 5 or 6 weeks after admission to the hospital.

When we come to fractures of the bodies of the vertebrae, we have a different proposition and a very serious one. These fractures almost always occur as a result of a flexion injury thus forcibly pushing the bodies of the vertebrae together, driving together the intervertebral disks and causing anteriorly and posteriorly separation of the ligaments; also the articular facets of the spinous processes may be torn off or avulsed. Great force is required to cause a fracture of a vertebral body. It is easy to overlook these fractures at times, so be on your guard, as often these cases are diagnosed as ordinary back strain.

The diagnosis is usually simple. There may be local tenderness and local tumefaction. We get an accurate history of the injury and of course take an X-ray to include the anterior-posterior and lateral views of the entire spine. There is usually found loss of the intervertebral space with anterior wedging of the bodies and a zone of increased bone density.

The treatment of fractures of the vertebral bodies comprises, first, hyperextension, then the placing on of a plaster jacket and allowing the patient to become ambulatory after the first or second day subsequent to the placing on of the plaster. The fracture of the body of

the vertebra must be corrected; the curvature of the fractured vertebral body gives the same symptoms and position as the picture in chronic back strain. The hyperextension which we apply has to be carried to an extreme. The plaster jacket must come up as far as and fit snugly to the sternum in front, and just at the lower point of the scapula behind, with its lowermost extension about one half inch below the anterior-superior spine. The patient lies upon a specially constructed frame and after X-ray it has been shown that the compression fracture has been decompressed, we put on the plaster jacket while on this frame.

The treatment is preceded by morphine and scopolomine  $1\frac{1}{2}$  hours before the beginning of hyperextension and the fitting of the plaster jacket. It is better not to give the patient a general anesthetic in order that he may be able to tell you if there happen to be any symptoms suggesting damage to the spinal cord. The feet are left bare when doing the hyperextension. The reflexes are tested before the plaster is put on. The limits of hyperextension of course vary in different individuals. As a rule when this limit of hyperextension is reached there is noted pain at the lumbo-sacral junction. At this stage take the lateral X-ray to see if the compression fracture is corrected properly.

In very thin individuals while placing on the jacket they claim at times to have a feeling of impending calamity which is most probably due to the shallowness of their respirations. If it becomes necessary you may split the jacket slightly anteriorly. Remember that the vertebral column moves normally on the axis of the nuclei pulposi. When the compression fracture occurs this normal arrangement goes awry.

The following 4 months after the incidence of the fracture, during which period of time check-ups by X-ray are made, the patient is kept in the cast and usually we are able to remove it at the end of this 4 months. It may become necessary to replace the cast in certain cases. After the removal of the cast a back brace is used to aid the muscles to gradually develop back to normal and to prevent subsequent back strain. Special exercises for the back are given.

In end results at the Massachusetts General Hospital 40 percent of the cases were found to have fused themselves. The average time of their return to work was 6 months. Sixty percent formed spurs. Eighty percent lost some of the intervertebral disk space.

As regards injuries of the spinal cord itself there is a great deal to be said. In doing laminectomies we take the laminae off with rongeurs. It is a point to remember that the spinal cord should be most gently handled. Therefore watch out for the cord when



using the rongeurs on the laminae, and be gentle. Here also we use wrung-out but wet pledgets.

Spinal cord injuries are much more important than injuries to the bones of the spine. The question arises when shall we operate on a case of spinal cord injury. When the symptoms are *progressing* operate. When the symptoms are either *stationary* or *decreasing*, do *not* operate. Of course when dealing with injuries of the cauda equinae you may have matting and can be less conservative.

When in acute cases you have evidence of transverse myelitis and cordal block present, one must certainly explore the cord by laminectomy. Be always careful as to the prognosis you give. Oft-times there is a badly contused or a completely severed cord; then the patient is naturally in a bad way for recovery of function. If the cord be swollen you may split the arachnoid and the pia mater and allow the escape of fluid causing the pressure and the symptomatology. This may give good results; give the patient a chance by following out this procedure, even though at times the results are not good. All compressing fragments of bone (rare) are of course removed.

The care of the paralyzed patient in the hospital and afterwards is very important. He should be placed on an air bed as soon as possible and every effort made to keep the patient clean. A sawdust box is not a bad idea; the patient is placed in a box and lies upon the sawdust allowing us to dig under it to get at the patient and also remove the unclean dust whenever it becomes necessary and replace it with clean sawdust. These patients have to be watched carefully in regard to the care of the bowels and the bladder. Enemata and laxatives for the bowels are a necessity, as is also intensive bladder care.

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#### MALARIAL RELAPSE AFTER ATABRINE

By JULIAN LOVE, Lieutenant (Junior Grade), Medical Corps, United States Navy

The recent report by Morrow and Wieand of 53 cases of malaria treated by atabrine without relapse prompts this report of cases in which there was a recurrence of the disease after the recommended course of the drug had been given. The use of this drug was occasioned in a case of malarial relapse in which the patient continued to have recurrent chills in spite of several days of quinine therapy in 1 gram (15 grains) doses thrice daily. This case occurred in January 1933, at which time a reference to the use of atabrine appeared in Notes and Comments of the then current issue of the BULLETIN. The response to the new therapeutic agent was most satisfactory, and, so far as is known, there has been no recurrence whatsoever.

The following case reports are those in which relapse occurred:

*Case 1.*—E. D. K., a private United States Marine Corps, age 21, was admitted to the United States Naval Hospital, Brooklyn, with a diagnosis of malaria, benign tertian, on March 6, 1933. His admission complaints were attacks of headache, chills, fever, sweating, tiredness, and weakness.

In September 1932, while on duty in Nicaragua, the patient became delirious and had a high fever. Malarial parasites were found in the blood, and in order to clear up his condition it was necessary to resort to quinine intravenously. After recovery he was given quinine in 1 gram (15 grains) doses thrice daily for 52 days. Incidentally, the patient stated he did not miss a single dose and was very faithful in this post febrile course. On January 2, 1933, he left Nicaragua and arrived in the United States the 14th and went to his home in Kentucky on 1 month's leave. On February 4, he experienced a severe chill, and again, malarial organisms were found. In spite of 1 gram (15 grains) of quinine daily he had paroxysms every other day for the next fortnight and thereafter had alternating severe and mild chills daily. After he returned from furlough his medical officer transferred him to this hospital.

Physical examination on admission revealed a pale, tired, anemic white male of 21. He had lost 15 pounds in the past 2 months. Other than signs of anemia in the sclerae, mucous membranes, and skin, evidences of recent loss of weight, and a percussable splenomegaly, the examination was negative. The diagnosis of malaria, benign tertian with secondary anemia was verified by finding the organisms in the blood smear and an erythrocyte count of 3.8 million with a 71 percent hemoglobin.

The patient was started on the 7th of March with the recommended course of atabrine—0.1 gram (1.5 grains) three times daily for 5 days. The blood smear on this date as well as that on the 8th was positive for organisms, and on the latter day he had a chill followed by a temperature of 103° F. On the 9th of March, he was afebrile and felt better, and the smear failed to reveal the etiologic agent. On the 10th of March, the general improvement was more noticeable, and the spleen was no longer enlarged to percussion. The erythrocyte count on this date was 3.3 million with a 77 percent hemoglobin, and the leucocyte count was 4,650 with a normal differential. On the 14th, the patient complained of slight weakness, but the erythrocyte count had increased to 4.2 million with an 83 percent hemoglobin. On March 20, he had regained 6 pounds and had no complaints. His erythrocyte count was 4.9 million and the hemoglobin, 100 percent. The leucocyte count was 7,500 with 4 percent band forms, 45 percent segmented cells, 42 percent lymphocytes, 5 percent eosinophils, and 2 percent monocytes—a rather striking example of a Schilling "shift to the right." Daily smears during this period failed to reveal any organisms.

In an attempt to determine a criterion of cure it was felt that perhaps visualization of the spleen with "Thorotrast" (thorium dioxide) might be of value in that a normal-sized spleen would be favorable evidence of a true cure. Therefore, on the 23d, 24th, and 25th of March, 25 cubic centimeters of "Thorotrast" were given intravenously. Roentgen examination, thereafter, showed a definitely enlarged spleen. As a result of the "Thorotrast" the patient suffered a mild headache and general malaise.

On April 14 the patient had a malarial paroxysm, and the blood smear was positive for *Plasmodium vivax*. Atabrine in 0.1 gram (1.5 grains) doses thrice daily was again started, but the blood smear remained positive on the 15th, 16th, and 18th. He had a chill on the 16th, but none on the 18th. Attempts to give quinine by mouth at this time failed because it caused nausea and vomit-

ing. He was able to retain atabrine, however, so that a second course was begun on the 20th. Smears from the 19th on were negative. As a further preventative 0.5 gram (7.5 grains) of quinine were given intravenously on the 20th. Attempts, thereafter, to give quinine by mouth failed because of emesis caused by the drug. There were no side effects noticed after a total dosage of 3 grams (45 grains) of atabrine. Since that time we have heard of no further relapse although the patient was instructed to report any such to us.

*Case 2.*—P. M., a war veteran, age 38, was admitted to the United States Naval Hospital, Brooklyn, N.Y., on February 4, 1933, with a diagnosis of malaria. His chief complaints were pains in the stomach (especially on the left side below the rib margin, where he felt a lump), chills, headache, backache, bone aches, sore throat, and loss of appetite.

This patient was in the United States Army in 1932 and was on duty in Panama, where he acquired malaria. He was given 2 capsules of quinine 3 times a day, which relieved him considerably, but he did have several paroxysms. He stated that it took about a month before he recovered. He returned to the United States in August 1932.

The patient stated that he had been sick for about a month prior to admission. He would be seized with sudden chills, and in order to warm himself would take tablets of acetylsalicylic acid and wrap himself into blankets. Afterwards fever would be noted, followed by a cold sweat. The next day he would feel well, but the day after the process would recur, and this occurred about 15 times. He also noted pains in the stomach over the left lower rib area and was conscious of a mass there. After having had several of these paroxysms he told the attending physician, who thought he had "grippe", that he felt somewhat the same as when he had malaria fever in Panama, and this led to a smear examination for plasmodium and consequent transfer to this hospital.

Physical examination revealed a slender, acutely ill white male with anemic pallor. The examination was negative except for deviation of the nasal septum to the left, three missing teeth, tachycardia, and an enlarged spleen, which extended three fingers below the left lower rib margin and was very firm and exquisitely tender. The splenic area of the left lower chest was enlarged and definitely flat. The clinical diagnosis of malarial fever was proved by finding *Plasmodium vivax* in the blood smear. The blood count showed 6,650 leucocytes with 6 percent myelocytes, 6 percent juveniles, 14 percent band forms, 32 percent segmented, 32 percent lymphocytes, and 9 percent monocytes. There were marked polychromatophilia, and one plus anisocytosis and poikilocytosis.

This patient was immediately placed on atabrine, 0.1 grams (1.5 grains) three times a day by mouth. On the morning of the 5th he had a chill which was followed by a fever of 104° F., and then sweating. The smear was positive for benign tertian organisms and the blood count was 4,850 white cells with 4 percent band forms, 42 percent segmented, 46 percent lymphocytes, 3 percent eosinophiles, and 5 percent monocytes. On the 6th of February the patient was afebrile. The smear was still positive for benign tertian organisms. The leucocyte count was 8,000 with 1 percent juvenile, 25 percent band forms, 36 percent segmented, 14 percent lymphocytes, and 14 percent monocytes. On the 7th and 8th the smears were negative for malarial parasites. On the latter date the spleen, which had been gradually receding in size, was no longer palpable nor percussable. The splenic area of the left lower chest was of normal resonance.

Atabrine was discontinued on the 9th and on the 15th the patient felt very well, was recovering from his secondary anemia, and had regained 5 pounds

in weight. On the 3d of March he had made apparently a complete recovery and was discharged from the hospital.

On the 9th of March he was readmitted. Two days after discharge he had noted headache, and on the 8th he had a distinct chill, and smear examination disclosed *Plasmodium vivax*.

The patient was immediately started on atabrine 0.1 grams (1.5 grains) thrice daily for 5 days. Blood smears on the 10th and 11th were positive, and on the latter day the patient had a chill, fever of 101° F., and sweating. The smear on the 13th was negative, and there was no chill. On the 17th the patient complained of headache but the smear for malarial organisms was negative. A second course of atabrine was given and completed on the 22d. On the 27th the patient's diagnosis was changed to tonsillitis, chronic, and on the 7th of April tonsillectomy was done. On the 19th of April a submucous resection was done.

On the 23d, 24th, and 25th of March the patient was given 25 cubic centimeters of "Thorotrast" intravenously, and the spleen visualized. The roentgenogram showed a slightly enlarged liver and a moderately enlarged spleen. The patient was discharged on April 28, 1933. During this interval there was no evidence of secondary anemia. On admission on the 9th of March the differential blood count showed 1 percent juvenile, 8 percent band forms, 60 percent segmented, 21 percent lymphocytes, and 10 percent monocytes. On the 15th of March there was 1 percent juvenile, 6 percent band forms, 50 percent segmented, 38 percent lymphocytes, 2 percent basophiles, and 3 percent monocytes, indicating a "shift to the right." On the 20th of March this shift was further shown by differential count of 5 percent band forms, 54 percent segmented, 32 percent lymphocytes, 5 percent eosinophiles, 1 percent basophile, and 3 percent monocytes. The final count on the 26th showed 8,100 leucocytes with 4 percent band forms, 72 percent segmented, 16 percent lymphocytes, 3 percent eosinophiles, 1 percent basophile, and 4 percent monocytes. The patient was started on the 24th with 10 grains of quinine every night and instructed to continue this for 8 weeks. There has been no report of relapse.

In addition to these cases with relapse we had 3 cases of quinine relapsing malaria of tropical origin and 3 cases of malarialized paretics in which the response was satisfactory, and in which there has been no report of relapse. In these cases no quinine follow-up therapy was given. The patients had one paroxysm after the drug was started, and the organisms disappeared from the blood smear after the third or fourth day.

*Comment.*—Atabrine is an alkyl-amino-acridine derivative, related to methylene blue, and is a yellowish, bitter powder, soluble in water to the extent of 7 percent.

It was synthesized in 1930 by Mietsch and Mauss in the Scientific Research Laboratories in Elberfeld, Germany. Kikuth, following the method of Roehl in the study of plasmochin, found that atabrine was a schizonticide in rice-bird malaria, but had no effect on the gametes which, however, were rapidly destroyed by plasmochin which, in turn, was ineffective in the eradication of the schizont forms. Mühlens states that he has found a combination of the two in the ratio of plasmochin 1 part to atabrine 10 parts to

be the ideal effective antimalarial remedy in infections by *Plasmodium falciparum*. Atabrine is effective in the other two types. Plasmochin and quinine are gametocides while atabrine is a schizonticide. Weise has found atabrine in the urine several weeks after the treatment had been discontinued.

Sioli in the treatment of inoculated paretics found atabrine very efficacious. He states 0.6-gram (10 grains) dosage must be given before the blood streams will be cleared of parasites. He has given 0.2-gram (3 grains) doses three times daily with no side effects other than a yellowish discoloration of the skin. Peter had identical results in naturally acquired malaria. The skin discoloration has been shown by Green to be due to the acridin dyeing effect of the drug, for there was no increase in serum bilirubin to account for it on the basis of jaundice.

Schulemann, while recognizing the therapeutic value of quinine, points out its many deficiencies, including the secondary effects such as headaches, dizziness, tinnitus aurium, vertigo, and finally hemoglobinuria, are universally known. Furthermore it is recognized pharmacologically as a protoplasmic poison to which many persons have an idiosyncrasy. Its effect on smooth muscle in the pregnant woman may lead to abortion, and as emphasized by recent writers death of the infant. Its bitter taste makes it unpleasant to take, and in spite of the claims of some authors relapse is frequent even if taken for an 8-week period. On the contrary atabrine has no unpleasant side effects in effective dosage other than a transient skin discoloration. Das Gupta and others have used it with success in blackwater fever. The same author with his coworkers have shown that as a prophylactic agent atabrine is of no value. There are excellent discussions of atabrine in the *Lancet*.

In a consideration of the successes and failures of this newer agent in the treatment of malaria one should recall that only 15 doses of 0.1 gram (1.5 grains) have been used whereas an 8 weeks' course of quinine in 0.65 grams (10 grains) has been recommended to prevent relapse.

#### SUMMARY

The following inferences are drawn with respect to atabrine.

1. Atabrine is an effective antimalarial drug. It destroys the schizonts and gametes of the *Plasmodium vivax* and *Plasmodium malaria*, and the schizonts of *Plasmodium falciparum*. For the latter a combination of atabrine and plasmochin in the ratio of 10 to 1 is recommended.

2. Relapse will occur after the present recommended dosage of a course of 0.1 gram (1.5 grains) thrice daily for 5 days. Twice this amount appears to be harmless, but further studies as to proper dosage have yet to be made.

3. Two cases of malarial relapse after the usual recommended dosage of atabrine are reported.

4. A discussion of the various drugs used in the treatment of malaria is appended. Each of the 3 drugs used has its indication and they should be used in conjunction with each other and not to the exclusion of either.

5. A possible criterion of cure of malaria by "Thorotrast" visualization of the spleen is suggested.

## SUGGESTED DEVICES

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### A SIMPLE IMMOBILIZATION APPARATUS FOR FRACTURES OF THE CLAVICLE

By ROBERT E. BAKER, Lieutenant, Medical Corps, United States Navy

Fractures of the clavicle are not infrequent in the United States Naval Service, there having been 62 admissions during the calendar year 1931 and 63 admissions during the calendar year 1932, according to the annual reports of the Surgeon General.

When they do occur, the common site of fracture is in the middle third of the clavicle. The shoulder falls forward and inward and the lateral or outer fragment overlaps the inner fragment anteriorly.

A number of devices have been developed for use in the treatment of this condition, all having as their object the retraction and elevation of the shoulder on the affected side and retention in that position.

Probably the best known and most commonly used of these is the clavicular cross. This consists of a T-shaped splint made of two boards, the crosspiece being as long as the shoulders are wide and from 3½ to 5 inches wide. The vertical piece extends downward as far as the lumbar region and may be slightly narrower than the crosspiece. The entire splint is well padded and an adhesive strap anchors the vertical portion to the body. From the horizontal piece adhesive straps pass over the shoulders and through the axilla.

The chief disadvantages of the above method, in my experience, have been that the friction involved by the shoulder straps, even though well padded, tends to cause skin irritation, and ulceration at the points of maximum pressure, namely, where the straps cross the pectoral muscles. Secondly, that it is necessary to make frequent changes of padding, necessitating the use of a considerable amount of adhesive tape, bandages, etc.

I have devised a very simple substitute for the adhesive strapping which can be easily and quickly made on board ship with the assistance of the sailmaker. This consists of a canvas jacket, having no sleeves, and lacing up in the back. The T-splint is anchored at the bottom in the usual fashion as it has been found that adhesive tape does not have such a tendency to cut into the skin at that location. Then the canvas jacket (see figs. A and B) is put on and laced over the T-splint somewhat after the fashion of a corset. Cotton padding

is inserted about the front of the shoulder and around the armholes and, of course, more padding should be applied in front of the affected side.

It has been found that by the use of the above apparatus, effective immobilization at little expense can be accomplished and considerable time saved in making the necessary dressing changes. This apparatus also gives a maximum amount of comfort to the wearer, which is an appreciable factor.





FIGURE A.—FRACTURE OF CLAVICLE.  
Immobilization with T-splint and canvas jacket. Back view.

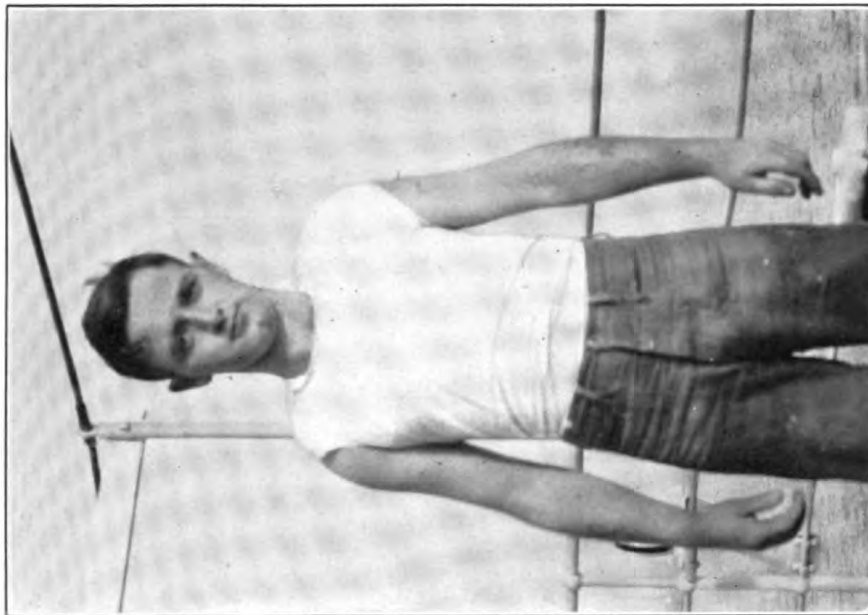


FIGURE B.—FRACTURE OF CLAVICLE.  
Immobilization with T-splint and canvas jacket. Front view.



## CLINICAL NOTES

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### LITHOPEDION ("STONE CHILD")

#### With Report of Case

By J. R. FULTON, Lieutenant, Medical Corps, United States Navy, and G. F. BLODGETT, Lieutenant (Junior Grade), Medical Corps, United States Navy

The authors are well aware of the constantly growing literature on lithopedion and the fact that there are many cases on record. This case is reported for the reason that it may be of some interest to medical officers of the Navy whose duties, with some exceptions, preclude the active practice of gynecology and obstetrics.

Lithopedion formation is comparatively rare, and is generally regarded as the most favorable outcome in advanced cases of extra-uterine pregnancy. The calcified fetus may be carried for years as a harmless foreign body or at subsequent labor it may give rise to partial or complete obstruction of the pelvis. McCormick reports a case in which the fetus was carried for 50 years without symptoms.

The formation of a lithopedion depends upon the fate of the fetus in extra-uterine pregnancy. Very early cases of extra-uterine pregnancy are no doubt absorbed either in the tube or after being extruded into the peritoneal cavity. When the fetus has attained a certain size it cannot be absorbed, and certain changes may take place to form a lithopedion. These changes are mumification, skeletalization, and finally, lithopedion formation.

Emmert in a recent article reports the life history of a lithopedion. In his case he had the privilege of observing the evolution of a lithopedion from beginning to end. This case was under observation over a period of 8½ years. The gradual change from a full-term abdominal pregnancy to a lithopedion about the size of a man's fist was followed by a series of X-ray films.

The history obtained in our case is somewhat incomplete due to the language difficulty, however it is believed that the fetus is about 16 years old. Our specimen is about one half the size of the one reported by Emmert. On these facts only we judge the fetus to have been in the middle stages of pregnancy. The long bones and parts of the pelvis are very distinct and easily recognizable. The whole fetus is densely calcified, brittle, and of stony hardness.

Although the literature contains many examples of women who have carried lithopedions without symptoms for many years it would appear to be possible, in our case at least, for a surgical emergency to have arisen at any time due to the rupture or erosion of some hollow viscus by the sharp, brittle extremities of the fetus which were only covered by a thin serous membrane and omental adhesions.

According to the literature there are very few cases in which the correct diagnosis is made prior to operation. Examination in this case revealed numerous large, subserous myomata of the uterus both before and at operation. The lithopedion was not diagnosed nor was such formation considered prior to operation. This patient was operated upon for a massive fibroid uterus and a supravaginal hysterectomy was performed.

#### CASE REPORT

A. W., female, age 40, Samoan half-caste, admitted to Samoan Hospital, from Apia, Western Samoa, complaining of pain and swelling in lower abdomen.

*Marital history.*—One child 22 years of age living and well. About 16 years ago she believes that she had a miscarriage. At least she was of the opinion that she was pregnant for about 4 months during which time she had all the common signs and symptoms of pregnancy. As is usual in these islands she did not visit a physician at that time. Following the months of amenorrhea she suddenly had sharp pains in her lower left abdomen and left flank with profuse bloody discharge from the uterus. She passed many clots but no placenta or fetus was found. She was confined in bed for about 10 days at this time but it was at least 3 months before she felt strong enough to carry on her usual duties. She has had no pregnancies since that time.

*Present illness.*—For about 7 years she has been conscious of a tumor in the lower abdomen which has gradually increased in size. She has had no menstrual disturbances during this period. Until several months ago she had no untoward symptoms except for pressure from the gradual increase in size of the tumor. For the past few months she has had considerable pain over the tumor mass and in the right flank.

*Physical examination.*—Examination at the time of entry revealed no abnormalities except in abdomen and pelvis.

On examining the abdomen a firm, hard, nodular tumor mass could be felt extending from beneath the symphysis up to the level of the umbilicus. Bimanual examination revealed a massive, nodular, fibroid uterus with multiple, pedunculated nodules filling both vaults and extending up on the fundus. If the lithopedion was palpated at this examination it was thought to be one of these nodules.

*Operation.*—November 16, 1933, under spinal anesthesia. A supravaginal hysterectomy was performed and except for the large size of the uterus and some difficulty in ligating the left uterine artery which was buried beneath one of the myomatous nodules, the operation was uneventful. At the time of operation the lithopedion was found in the lower abdomen. It was attached and invested by a long, thin, serous membrane to the left ovary and broad ligament below and with thin omental adhesions above. The lithopedion with its investing membranes and the left ovary were removed.

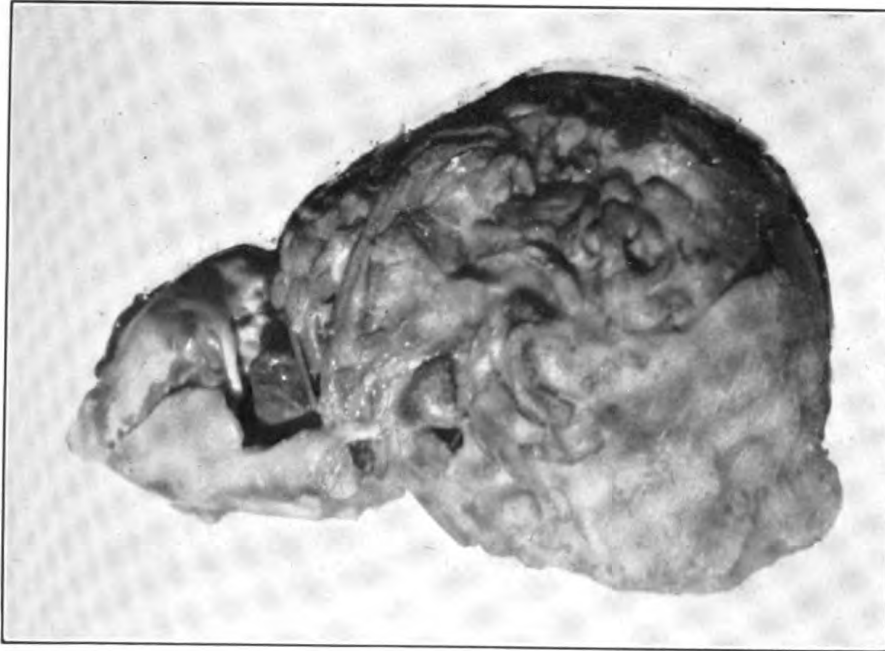


FIGURE 1.—LITHOPEDION.  
(Slightly enlarged.)

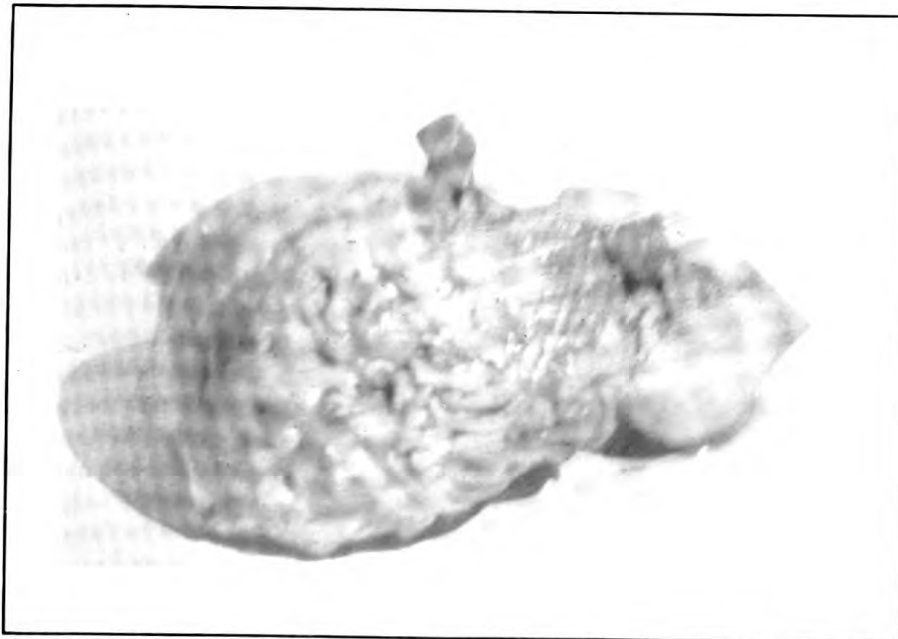


FIGURE 2.—LITHOPEDION.  
Showing projecting extremity (normal size).



*Progress.*—The patient had an uneventful convalescence and was discharged from hospital 14 days after operation.

*Pathological report*—*a. Lithopedion.*—Weight 32 grams, length 69 millimeters, largest circumference 122 millimeters, smallest circumference 70 millimeters. The whole specimen is of stony hardness. The long bones project from the specimen and are very distinct.

*b. Uterus.*—Weight 1,157 grams. The specimen shows numerous pedunculated subserous nodules as well as many intramural myomata. The endometrium is apparently normal.

#### REFERENCES

1. Emmert, F.: The Life History of a Lithopedion. Surg., Gynec. & Obst., 1932, vol. LV, pp. 646.
2. McCormick, E. J.: Retention of Perfectly Formed Fetus in Abdominal Cavity over Half Century. Ohio State Med. Journ., June 1, 1926, pp. 501.
3. Titus, P. and Elseman, J. R.: An Eight Months' Extra-Uterine Pregnancy Calcified and Retained for Forty Years. Amer. J. Obst. and Gynec., February 1932, pp. 217.
4. Kelly-Noble: Gynecology and Abdominal Surgery. 1910, vol. II, pp. 150.
5. De Lee: Principles and Practice of Obstetrics. Edition IV, p. 415.

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#### A CASE OF GRANULOCYTOPENIA IN A NATIVE OF GUAM

By C. L. ANDREWS, Lieutenant (Junior Grade), Medical Corps, United States Navy

There is perhaps no blood dyscrasia, whose exact etiology, treatment, and prognosis, rests upon such an insecure and precarious basis as the clinical syndrome known as granulocytopenia (agranulocytosis). Because of this assumption and the rarity of the condition, I feel that every case that falls into this classification is worthy of thorough and searching scrutiny.

*History.*—On September 5, 1933, an adult Chamorran (Polynesian) male was admitted to the United States Naval Hospital, Guam, complaining of sore throat, fever, and generalized weakness. These symptoms were first noted about 5 days prior to entry to the hospital and had gradually increased in severity up to the time of admission.

There was little of interest in the past history except that a diagnosis of yaws was made on July 31, 1933, for which the patient had been receiving neoarsphenamine at weekly intervals. He had received a total of 2.15 grams in five injections. Following the last injection he developed the above symptoms. There was no history of preceding attacks of weakness or easy fatigability.

*Physical examination.*—The essential features of physical examination were extreme fatigue and general weakness, palpable anterior cervical and epitrochlear lymph nodes and marked inflammation of pharynx, tonsils, and uvula, which were covered with a dirty yellowish exudate. Temperature was 103.6; pulse, 112; and respiration, 24.

*Laboratory Procedures.*—A smear from the throat lesions showed the presence of a few Vincent's spirilla and fusiform bacilli. A culture was negative for Klebs-Loeffler bacillus and hemolytic streptococcus. White blood count on admission was 3,000. The differential count showed only 3 percent polymorphonuclear cells with 83 percent lymphocytes, and 12 percent mononuclears

and transitionals. The red blood count was 4,000,000 and haemoglobin 75 percent. The platelet count was within normal limits. Urinalysis showed 3 plus albumin and a few coarsely granular casts.

*Differential diagnosis.*—Such a blood picture together with the clinical findings already mentioned could hardly be considered coincidental. Repeated checking of the blood count yielded similar results and at once we were faced with the interesting problem of proper classification, treatment, and prognosis of an obscure blood dyscrasia. In reviewing the 79 cases reported by McCarthy and Wilson we found they had classified those blood dyscrasias following the arsphenamines into 3 main classes. The first group was called the thrombocytopenic group and contained those cases in which loss of blood platelets was the primary pathological feature. The second group was termed the granulocytopenic group and was confined to those cases whose granular white blood count was decreased. The third group or aplastic group as it was called contained cases in which the red blood count was constantly reduced, usually below 2,000,000 and leukopenia was likewise a constant finding with reduction in the percentage of neutrophilic granulocytes in all cases. Considering neoarsphenamine as the etiological factor and adapting our case to the above classification we decided that it belonged definitely to the second or granulocytopenic group.

*Treatment.*—Having considered neoarsphenamine, with either the arsenic or benzene radical, as the etiological agent we deemed it advisable to institute sodium thiosulphate therapy at once, in order to neutralize any added toxicity caused by the arsenic. On the other hand if it is true that the blood picture in granulocytopenia depends on the constant absorption of toxic products as in chronic or encapsulated focal infection, then why not treat the local infections intensively? We therefore at once instituted the following therapy: Sodium thiosulphate intravenously 15 grams; sodium thiosulphate by mouth 30 grams daily; hot Dobell's gargle every half hour; 10 percent argyrol solution to throat lesions twice daily; sodium bicarbonate 30 grams and sodium salicylate 30 grams 4 times daily; forced fluids; and high caloric liquid diet.

*Progress.*—For the first 4 days patient's throat appeared to show no improvement. His temperature remained between 102° and 104° while patient showed evidence of marked prostration. On the fourth day one myelocyte and one band-form appeared in the differential count. On the fifth day temperature ranged from 99.8° to 100.3° and the white blood count was 4,100, while the differential count showed the following: Myelocyte 1, juveniles 10, band forms 13, segments 16, lymphocytes 28, mononuclears 27, and eosinophiles 5. The intravenous sodium thiosulphate was discontinued on the third day but the other therapy, including sodium thiosulphate, by mouth was continued. On the seventh day the temperature was normal, the white blood count was 7,600 with a total of 52 percent polymorphonuclear cells. With the fall in temperature to normal and the restoration of granular cells to the circulating blood the throat lesions improved rapidly. Within 2 weeks after admission the patient was, from all laboratory and clinical evidence, a well man. He was discharged from the hospital on November 5, 1933, in excellent physical condition and with a normal blood picture.

*General discussion.*—We have assumed that the etiological factor was neoarsphenamine. Whether or not we were justified in so doing is a debatable question just as it is also a debatable question in other cases of blood dyscrasias, where benzene or arsphenamine has been considered the etiological factor. I feel that in this case neoarsphenamine was the direct causative agent. In cases of granulocytopenia which recover the mechanism of recovery is twofold: Either a spontaneous remission occurs or, if we wish to credit certain therapeutic agents we say that by virtue of their administration, a stimulation of



the bone marrow ensues resulting in the restoration of granulocytes to the circulating blood. In the case we have presented we have been forced to drop the possibility of therapeutic stimulation of bone marrow because the patient received no drug capable of bringing about any such stimulation. Therefore, unless we accept the view of spontaneous remission, we must conclude that either one of two things happened:

1. The granulocytopenia was brought on as a result of the constant supply of toxin which entered the body from pyogenic bacteria located in the throat lesions and restrained from actual penetration of the tissues.

If this assumption is correct we might logically reason that as a result of intensive local treatment of the throat lesions the source of toxin to the body was eliminated. The experimental work of Dennis would strongly support such a theory.

2. The second conclusion presumes the granulocytopenia to be the direct result of the organic arsenic factor of the neo-arsphenamine. Assuming this to be correct we may conclude that the sodium thiosulphate brought about a neutralization of the toxicity brought on by the arsenic. This view is of course contrary to the belief generally held that it is the benzene radical of arsphenamine which is responsible for the disturbed bone marrow function. Organic arsenic is known to produce various types of bone marrow depression and the arsphenamines may attack any or all of the elements of the bone marrow. It will be noted that we failed to utilize blood transfusion, stimulating doses of X-ray or pentose nucleotide, the agents most generally accepted as worthy of trial in the treatment of cases of granulocytopenia. One reason for so doing was the early favorable response of the patient to the therapy already described. We were thus able to limit the field of discussion regarding the mechanism of recovery.

In conclusion, we may say that while the exact etiology and the mechanism of recovery involved in cases of granulocytopenia is as yet vague, the conception of an underlying myeloid hypoplasia or hyperplasia no longer holds its prominence as an etiological factor in granulocytopenia.

#### REFERENCES

1. F. P. McCarthy and Robert Wilson, Jr.: The Blood Dyscrasias Following the Arsphenamines. *Journal of the American Medical Association*, November 5, 1932.
2. Experimental Agranulocytic Angina. Editorial, *Journal of the American Medical Association*, July 29, 1933.
3. Adolph B. Loveman: *Archives Internal Medicine*. 5:1238, April 1932.

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#### ACUTE ALEUKEMIC LEUKEMIA RESEMBLING IN ITS EARLIER PHASES AGRANULOCYTIC ANGINA AND APLASTIC ANEMIA

By GERALD W. SMITH, Lieutenant, Medical Corps, United States Navy

The following case of acute aleukemic leukemia is reported. It is of interest principally because of the differential diagnosis which it involves revealing the fact that accurate differential diagnosis in the field of blood dyscrasias is often difficult. The following case is reported in some detail and affords an interesting problem.

53340—34—7

*Case history.*—F. P., a marine, aged 25, was admitted to the Naval Hospital, Portsmouth, N.H., from the United States Naval Prison on March 8, 1933.

*Chief complaint.*—Weakness and shortness of breath.

*Family history.*—Irrelevant.

*Past medical history.*—He gave a history of having had the usual childhood diseases, frequent head colds, occasional attacks of sore throat, a bubo 1 year ago and an upper respiratory infection in February 1933, lasting for 10 days.

*Present illness.*—The week prior to reporting to the doctor at the naval prison, where he had been on inside patrol duty, he felt weak, had occasional spells of dizziness and frequently had to stop and rest in order to get his breath after slight exertion. He noticed that he looked pale and that his endurance and strength were failing him. On March 7, 1933, he developed a slight rise in temperature with symptoms of malaise, headache, lassitude and loss of appetite. The following day he was admitted to this hospital.

Physical examination on admission revealed a well developed and muscular marine weighing 180 pounds. His skin and conjunctiva were slightly icteric. His temperature was 101 F., pulse rate 115 and respiration 20 per minute. His blood pressure was 120 systolic, 70 diastolic. Tonsils were slightly hypertrophied and cryptic but not inflamed. There was no cervical adenopathy. His chest was clear and expansion normal; abdomen soft and not tender; liver not enlarged and spleen not palpable. Genitalia and extremities were normal. Neurological examination was negative.

Laboratory findings revealed a normal urine and a negative blood Kahn test. Red blood corpuscles numbered 3,000,000 and hemoglobin content was 60 percent (Sahli). There were 3,100 white blood cells of which 68 percent were lymphocytes, 4 percent monocytes; polymorphonuclears: 23 percent segmented, 4 percent band forms and 1 percent juvenile. An occasional stippled cell was noted. Red cell fragility test revealed slight increase in resistance to hypotonic salt solution. Blood icterus index was 13 and Van den Bergh reaction was positive direct delayed; quantitative, 8.2 milligram bilirubin per liter. Blood platelet count was 400,000 per cubic millimeter. Gastric analysis results were within lower normal limits.

March 9 the patient complained of headache and increased weakness. Routine symptomatic treatment and liver therapy were instituted. He appeared slightly jaundiced but had few complaints. He requested to go on liberty though his temperature was slightly elevated.

March 10 in addition to the headache, he complained of a sore throat. His pharynx appeared slightly inflamed on examination.

March 12 throat was so painful that he could swallow only with difficulty. Pharynx appeared angry red on examination and there was some cervical glandular enlargement associated with tenderness. Dyspnea was more marked and he remained in bed though preferred to sit up.

March 13 white necrotic patches appeared on both tonsils and the cervical glands became more tender. Temperature continued to range between normal and 100 F. His jaundice had not increased. A complete blood examination that morning showed a white cell count of 2,650; red blood cells 2,650,000 with the following differential: polymorphonuclear segmented forms 21 percent, band forms 9 percent, lymphocytes 69 percent, and monocytes 1 percent. A throat smear revealed numerous fusiform bacilli and spirochetes. That evening another blood examination was made disclosing a further decrease to 15 percent in the neutrophilic leukocytes and a relative increase in the lymphocytes to 85 percent. No immature white cells were present in the blood smear. At this stage the clinical and laboratory picture resembled closely that of agranulocytic angina though usually in this condition the anemia is not so severe until

the terminal stages. There was no change in the morphological structure of the red blood cells and no immature red or white cells were found. However, in view of the nearly complete agranulocytic blood picture, the prognosis could not be considered anything but unfavorable. He was placed on the serious list and his relatives notified. Deep X-ray therapy to long bones, liver extract by mouth and by the intravenous route were used with the hope of stimulating his hemopoietic system. His reticulocyte count at this time was only 0.11 percent.

March 14 the necrosis in posterior pharynx and tonsils had advanced. Large petechia were noted over soft palate and a small ulceration had started adjacent upper right molar. Slight hemorrhages were occurring from these lesions and the pain was intense. He had difficulty in sleeping and could not remain in the prone position because of severe dyspnea. A blood examination showed further reduction in all elements. Red blood count was 1,900,000; white blood cells numbered only 1,600 with a hemoglobin content of 45 percent and a color index of 1.5. Polymorphonuclear segmental forms were 12 percent, band forms 2 percent, and juveniles 2 percent. Lymphocytes were 84 percent. Reticulated cells were 0.17 percent showing so far a poor response. His temperature continued septic in character, ranging from 100 F. to 102 F.

March 15 a transfusion of 500 cubic centimeters of blood was done and immediately subjective improvement was noted and his dyspnea became less marked.

March 16 he continued to show a good response from the blood transfusion. Pain in throat was now less severe and the pharyngeal inflammation was beginning to subside. His temperature remained elevated to 101 F. and his red blood count had risen to 2,050,000, and white cells to 1,350. Polymorphonuclear segmental forms were 50 percent, band forms 4 percent, and lymphocytes 42 percent with 4 percent monocytes. Platelet count was 157,000 and reticulated red cells had increased to 1.1 percent.

March 18 it became apparent that the improvement was only temporary. The red blood cells were now down to 1,600,000 and the white blood cells to only 960. Hemoglobin content was 40 percent lymphocytes 60 percent; polymorphonuclear segmental forms 36 percent and band forms 9 percent. It was evident that the increase in the granulocytes subsequent to the blood transfusion had caused a marked improvement in the pharyngeal necrosis. The pain and discomfort were less severe and the inflammation was beginning to subside. His temperature remained around 100 F. to 102 F. Palpation of abdomen elicited some tenderness in epigastric region but no splenic or liver enlargement was elicited.

March 20 the blood findings showed a further reduction. The white blood cells had fallen to 600; the red blood cells to 1,500,000 with 40 percent hemoglobin content. Lymphocytes were 57 percent, polymorphonuclear segmental forms 36 percent, band forms 2 percent, and monocytes 4 percent. Blood platelet count was only 34,760. The red blood cells showed anisocytosis, poikilocytosis with occasional normoblasts. Over his thighs were small petechial hemorrhages and he vomited a dark-colored substance containing some occult blood. He had difficulty in retaining anything by mouth. The severe anemia, leukopenia and thrombopenia now encountered presented a typical picture of aplastic anemia. The toxic or infectious process was now affecting the formation of all the blood elements and there appeared to be almost an absolute paralysis of his bone marrow.

March 22 the reticulocyte count was up to 0.8 percent. This increase was probably due to the large quantities of liver extract that he was taking and to the deep X-ray therapy which was applied to the long bones. He complained

severely of abdominal distress, frequently vomited, and constantly felt nauseated. His feet were becoming edematous. His blood pressure was now 90 systolic and 50 diastolic with a pulse rate of 100. His optimism and cheerfulness which were so conspicuous up to this time were beginning to disappear. Insomnia and restlessness increased and morphine had to be used to ameliorate his abdominal distress. He remained in the sitting position and air hunger was marked. The red blood cell count was 1,580,000 with the white blood count of 1,450. Color index remained above one. Lymphocytes had increased to 61 percent and polymorphonuclear segmental forms were 32 percent with 4 percent mononuclears. It was some encouragement to note that the white blood count was increasing. The throat was now clear and he was free from pharyngeal pain and discomfort.

March 25 the red blood cell count reached 2,220,000 with further increase in the white blood cells to 3,150, with 39 percent lymphocytes, 47 percent polymorphonuclear segmentals, 7 percent band forms, and 4 percent monocytes. Reticulated red cells were now 12 percent. Patient appeared to be improving. His dyspnea and abdominal discomfort were less severe, pallor was less marked, and food was being retained better.

March 27 patient's abdomen was becoming distended. Tympanites was marked. Pain and discomfort were severe in epigastrium. Gastric irritability was increasing and no food could be retained. Red blood count was now 1,850,000, white blood cells 9,560, hemoglobin 50 percent, color index 1.25, and platelets 98,000. Differential count showed polymorphonuclear segmentals 28 percent, band forms 4 percent, juvenile 10 percent, lymphocytes 57 percent, and monocytes 3 percent. Forty percent of the lymphocytes were now of the large immature type. The red blood cells now showed marked anisocytosis and poikilocytosis with occasional normoblasts.

His septic temperature continued, ranging from 101 F. to 103 F. Dyspnea was more severe. A good deal of tenderness was elicited over the spleen which was now enlarged and easily palpable. The inferior surface of liver was 4 centimeters below costal margin and tender to palpation. The chain of lymphatic glands in cervical region had begun to enlarge. The axillary glands were now easily palpable. With the change in the blood picture and the clinical findings, the diagnosis of acute lymphatic leukemia was established.

March 30 the patient was stuporous and irrational. The edematous condition of feet and ankles had increased. The spleen had enlarged to 6 centimeters below costal margin. Abdomen was distended and free fluid was present. Air hunger was severe. Temperature range was between 101 F. and 103 F.; pulse rate was between 99 and 120 with respiratory rate of 35. The heart developed a "gallop" rhythm and a systolic murmur appeared over third and fourth interspaces. Chest findings were indicative of congestion generally, but no evidence of any consolidation. Blood pressure was 90 systolic and 40 diastolic.

April 1 the white blood cells had increased to 57,650 with a 97 percent lymphocyte content comprised largely of immature cells. The red cells numbered 1,530,000 and the blood smear showed marked anisocytosis and poikilocytosis with numerous normoblasts. Blood platelet count was 16,500. Abdominal pain and distension had increased. Copious emesis of dark red blood occurred, temperature rose to 105 F., and Cheyne-Stokes respiration followed. Pulse became thready and patient lapsed into deep coma. Death occurred the following morning at 3 a.m.

*Clinical diagnosis.*—Acute aleukemic leukemia, lymphatic type.

## AUTOPSY FINDINGS; 1 HOUR POSTMORTEM

Skin lightly jaundiced and sallow. Hemorrhagic area on left arm. There was a generalized lymphadenopathy. Abdomen was tense and distended. Both ankles and feet edematous. Scrotum enlarged, contained free fluid. There was about 800 cubic centimeters of free straw-colored fluid in peritoneal cavity. Liver extended down to umbilicus and across to left nipple line. Its surface was smooth and had a mottled nutmeg appearance. It weighed 3,380 grams. Dimensions were 30 by 25 by 9 centimeters. Spleen was soft in consistency, red and enlarged. It weighed 1,440 grams. Dimensions were 23 by 18 by 9 centimeters. Numerous hemorrhagic areas were scattered over intestines. The mesenteric lymph glands were enlarged and more numerous than normal. The left kidney was pale and edematous. It weighed 720 grams. Dimensions were 16 by 10 by 7 centimeters. Kidney capsule was adhered to cortex. Numerous infarcts were present over surface of cortex. The right kidney presented the same picture as the left. It weighed 480 grams and was 14 by 8 by 5 centimeters in dimension. A section of bone from the sternum showed the bone marrow to be pale, grayish-red in color. Lungs were normal in consistency. Heart showed no hemorrhagic areas. About 100 cubic centimeters of yellowish fluid were contained in pericardium.

*Gross anatomical diagnosis.*—General cervical lymphadenopathy; hemorrhage into subcutaneous tissue, mucous membranes and serous surfaces; splenic tumor with lymphoid hyperplasia; cloudy swelling and fatty change in liver; acute hemorrhagic kidney with multiple infarcts.

The following autopsy report was received from the United States Naval Medical School, April 11, 1933. The blood smears reported on were obtained from the patient on the dates given.

## MICROSCOPICAL EXAMINATION

*Liver.*—The cytoplasm of the polygonal cells is granular and the sinusoids are dilated and congested with erythrocytes and a scattering of mature and immature lymphocytes. There is an increase in the periportal tissue which is heavily infiltrated with mature and immature lymphocytes. There is no evidence of bile duct proliferation. The vessels are congested and their walls are thickened. All congested vessels not only contain erythrocytes but noticeable numbers of lymphocytes.

There is some hemosiderin stored in the Von Kupffer cells of the sinusoids.

*Pancreas.*—The epithelial cells of the acini show varying stages of degeneration and some post-mortem change. The inter and intra lobular stroma is filled with lymphocytes. The islands appear essentially normal. There is generalized vascular congestion.

*Kidney.*—There is a very marked interstitial lymphatic infiltration leaving little connective tissue and a prominent scattering of tubules. These tubules appear moderately dilated and the lining epithelium is atrophic and there is marked degeneration. Some tubules contain desquamated epithelium and fine granular amorphous material. The glomeruli show moderate congestion but many are shrunken and atrophic. The capsule consists only of a narrow band of fibrous tissue and is heavily compressed externally by the infiltrating lymphocytes. The vessels are essentially normal but are congested.

*Spleen.*—The malpighian corpuscles are ill-defined and can only be designated by the central arteriole. Throughout the pulp there is a marked accumulation of mature and immature lymphocytes at the expense of the reticulo-endothelium. The stroma reticulum is scanty and the trabiculi are fragile.

The sinusoids are dilated and congested with erythrocytes and lymphocytes. There is a very thin fibrous capsule which is considerably congested.

*Lungs.*—The lung is essentially normal with the exception of generalized vascular congestion and slight lymphatic infiltration in the walls of the bronchioles and fibrous stroma about the blood vessels.

*Lymph nodes.*—All sections of lymph nodes are similar. There is a thin fibrous fragile capsule which is invaded by lymphocytes. The pericapsular fat and fibrous strands also contain a noticable number of lymphocytes. The usual follicular structure of the nodes is destroyed. The reticulum is obscured and replaced by a close packing of mature and immature lymphocytes. The trabiculi are also ill-defined and fragmentated. An occasional congested vessel is seen.

*Bone marrow.*—The myloid cells and erythroblasts are nearly completely replaced by engorgement of mature and immature lymphocytes. Only a very occasional megakaryocyte is present. In addition to the infiltration of lymphocytes there is a diffuse engorgement of erythrocytes. The reticulo-endothelium appears depressed.

*Pathological diagnosis.*—Leukemia, lymphatic, acute (with involvement of liver, spleen, kidneys, pancreas, lymph nodes, lungs, and bone marrow).

Parenchymatous degeneration, liver, pancreas, and kidneys.

Passive congestion, liver, pancreas, kidneys, spleen, and lungs.

Myelonephthisis.

#### DIFFERENTIAL COUNTS OF BLOOD SMEARS

March 28, 1933:

Bands	14
Segmental	26
Lymphocytes	57
Monocytes	3
	<hr/>
	100

*Blood picture—Red blood cells.*—Marked anisocytosis and poikilocytosis. Macrocytes predominate. Two normoblasts noted. Occasional basophilic stipple noted.

*White blood cells.*—Neutrophils contain a large number of toxic granules. Five percent increase in the bands. Approximately a 50 percent decrease in the segmented.

Lymphocytes, 50 percent increase in the lymphocytes; 28 percent of total lymphs are of a large immature type.

*Blood platelets.*—Greatly diminished in size and number.

March 28, 1933:

Bands	14
Segmental	17
Lymphocytes	69
	<hr/>
	100

*Blood picture—Red blood cells.*—Marked anisocytosis and poikilocytosis. Macrocytes predominate. One normoblast noted. Occasional basophilic stipple cell noted.

*White blood cells.*—Neutrophils show a large number of toxic granules. Six percent increase in the band forms, with a decrease of approximately 75 percent in the segmented. Lymphocytes show approximately a 100 percent

increase with 44 percent of total number of the large immature form. Small lymphs are of the immature type. Blood platelets appear greatly diminished in size and number.

April 1, 1933:

Bands	2
Lymphocytes	97
Monocytes	1
	<hr/> 100

**White blood cells.**—Two band from neutrophils noted. Lymphocytes. 96 percent were of the large immature type. One immature small lymphocyte.

**Red blood cells.**—Marked anisocytosis and poikilocytosis. Macrocytes predominates. No stippling noted. Numerous polychromatophilic staining macrocytes. Two normoblast and one macronormoblast noted. Slight achromia.

Blood platelets greatly diminished in size and number.

Autopsy sections were also forwarded to Dr. Francis T. Hunter of Boston who was very much interested in this unusual case. He reported the following:

"Dr. Mallory has finally completed the studies of your patient, F. Patrenets, and has decided that what he had was a lymphatic type of leukemia. We are very interested to add his case to our collection because we have seen, as I told you before, the opposite occurring—leukemia ending in agranulocytosis, but this is the first case I have seen of a leukemia beginning as agranulocytosis and then becoming more or less typical. Dr. Mallory reports generalized leukemic infiltration of practically all the tissues that were sent to us."

TABLE 1.—Case of F. P.

Date	Red blood cells	White blood cells	Hemoglobin	Color index	Polymorphonuclears			Lymphocytes	Monocytes	Platelets	Reticulocytes	Percent immature lymphocytes	Remarks
					Band form	Juvenile form	Segmental						
1933			Pct.					Pct.	Pct.		Pct.		
Mar. 8	3,000,000	3,100	60	1.7	4	1	23	68	4	400,000	-----	-----	
10										330,000	-----	-----	
13	2,650,000	2,650	45	1.5	9	-----	21	69	1	-----	0.11	-----	Tonsils ulcerated.
14	1,900,000	1,600	45	1.5	2	2	12	84	-----	-----	.17	-----	Deep X-ray therapy, long bones.
15	1,820,000	1,650	42	1.1	12	2	14	72	-----	-----	.18	-----	Blood transfusion, 500 cubic centimeters.
16	2,050,000	1,350	40	1.1	4	-----	50	42	4	157,000	1.10	-----	Tonsils less inflamed.
17	2,000,000	1,200	40	1.2	5	5	45	45	-----	-----	-----	-----	Petechia on palate.
18	1,540,000	960	40	1.2	2	-----	30	63	4	90,000	.66	-----	
19	1,460,000	950	40	1.4	9	1	32	56	2	-----	-----	-----	
20	1,500,000	600	40	-----	2	1	36	57	4	34,750	-----	-----	Deep X-ray therapy, bones.
21	1,570,000	1,350	41	1.3	2	1	32	61	4	34,000	2.16	-----	Severe abdominal pains.
22	1,580,000	1,450	-----	1.2	3	-----	32	61	4	-----	9.80	-----	
23	2,120,000	3,250	49	1.1	2	2	52	42	2	106,000	8.00	-----	Intraven. liver injection.
24	2,190,000	2,200	52	1.2	5	2	56	26	11	98,550	11.80	-----	
25	2,220,000	3,150	-----	-----	7	3	47	39	4	-----	12.00	-----	
26	1,690,000	4,000	45	1.4	14	-----	26	57	3	145,440	7.40	28	Liver, spleen, enlarged.
27	1,850,000	9,560	50	1.2	4	10	26	57	3	98,000	-----	40	Axillary glands enlarged.
28	1,800,000	11,000	45	1.2	14	-----	16	70	4	38,000	5.30	44	
29	1,770,000	12,550	41	1.2	3	3	19	75	-----	90,270	2.70	55	Intraven. liver injection.
30	2,090,000	22,700	42	1.5	2	-----	6	92	-----	98,808	2.30	75	Stuporous condition.
31	1,580,000	28,600	40	1.3	2	-----	7	91	-----	-----	-----	90	Edema of legs.
Apr. 1	1,530,000	57,650	40	1.1	2	-----	-----	97	1	16,500	-----	97	
2													Death at 3 a.m.

During the first week this patient was under observation his condition resembled closely that of agranulocytic angina. This condition was first observed by Schultz (1) in 1922. He called attention to a symptom complex, rapidly proving fatal, usually occurring in elderly females and characterized by a septic temperature, a leukopenia, a necrotizing process in the throat, a rapidly developing exhaustion, slight jaundice with only a slight alteration in the number of red blood cells and platelets and an almost complete absence of granulocytes.

Since Schultz's original paper over 250 cases described as agranulocytic angina have been reported (16). A large number, however, have not conformed to his original description of the condition for in some cases hemorrhagic symptoms have been present, while in others, severe anemia and involvement of the red blood cells have occurred. Blumer (2) reports a number of cases showing that local and general sepsis not affecting primarily the skin and mucous membranes may be accompanied by a leukopenia and an agranulocytic blood picture. It has been noted that in any condition where a partial or complete agranulocytosis exists, a necrotizing process in the throat is usually present. There has also been a prudent hesitation on the part of the medical profession to admit that agranulocytosis is an actual disease entity.

Hunter (17) in discussing agranulocytic angina states that this term covers a number of conditions in which extreme leukopenia is the predominate clinical finding.

He suggests six types of agranulocytic states:

1. An acute type, occurring in middle-aged women, with sudden onset and death in 3 to 5 days. (These respond fairly well with nucleotide.)
2. A chronic type in which the white count is never extremely low, who may be ill a long time, may die or recover, and who do not respond well to any form of therapy.
3. A recurrent type, seen frequently in women, where they are perfectly well between attacks. (There may be some relation in these cases to ovarian function.)
4. Agranulocytosis associated with a known focus of infection such as sinus or ischiorectal abscess.
5. Agranulocytosis with known chemical poisoning, such as benzol or arsphenamine.
6. Agranulocytosis or acute aleukemia, seen in known leukemias, either in the acute type or sometimes terminally in the chronic type, either myeloid or lymphatic.

It was evident from the very outset that we were dealing with some type of agranulocytic state and that the prognosis was unfavorable. The history ruled out chemical poisons and irradiation. The



clinical and hemotologic picture conformed fairly closely to the agranulocytic angina described by Schultz. If this patient had died during his first week in the hospital, his clinical diagnosis would undoubtedly have been agranulocytic angina. This brings up the question as to whether a number of cases similar to this one are not mistakenly diagnosed as agranulocytic angina where death ensued before the cycle had been completed. It is quite likely, however, that at autopsy the bone marrow would be found to be filled with immature lymphocytes even during the early stages of the disease, making the diagnosis of leukemia obvious. As the increase in these primary cells continued and filled the bone marrow the formation of the red cells and platelets was retarded. This evidently occurred, resulting in the severe anemia, purpuric spots, anisocytosis, poikilocytosis, normoblast formation, marked leukopenia and neutropenia which developed during the second week this patient was under treatment. At this stage the clinical picture changed from that of agranulocytic angina to that of aplastic anemia.

Aplastic anemia usually occurs in young individuals who are in a fair state of nutrition. The patients show a definite yellowish or grayish pallor of their skin, usually with hemorrhages into the skin and mucous membranes. An angina is usually present accompanied by a septic type of temperature. The blood picture shows: 1. A leukopenia with a relative lymphocytosis. 2. A severe anemia often as low as 500,000. 3. Thrombocytopenia; the platelets are usually less than 75,000. In other words there is an aplasia of the bone marrow as a whole and at autopsy the bone marrow is found to be soft, yellow, and almost completely replaced by fat. The outcome in all cases is fatal and no form of treatment has proved efficacious. Carey and Taylor (12) estimate that up to this time only 150 true cases of primary aplastic anemia so far have been reported. A change in the marrow either due to toxic or chemical agents causes the production of blood elements to be retarded, often completely inhibited; therefore the profound anemia occurs. Benzol, trinitrotoluene, roentgen rays, radium emanations, prolonged infectious diseases, all affect the hematopoietic system in such a manner as to produce aplastic anemia.

In agranulocytic angina, on the other hand, the marrow is unaffected except for the production of the white forming elements. There is only, as a rule, slight anemia unless in the terminal stages and then of the achromatic type and without appreciable reduction of platelets. The anemia is "secondary" and the red cells show achromia and microcytosis.

With the onset of the severe epigastric pains during the final week under treatment the white blood cells began to rise and were composed largely of the immature lymphocytic type. The spleen and

liver became easily palpable. The number of platelets was further reduced and the cervical and axillary glands became tender and enlarged. The temperature variation increased and dyspnea and prostration became marked.

It became evident that we had been dealing with an acute aleukemic leukemia and that we had fortunately observed an unusual blood cycle which had passed through 3 fairly separate phases: the agranulocytic stage, the aplastic stage, and last, the leukemic stage.

#### CONCLUSION

1. A case of acute aleukemic leukemia is presented.
2. The difficulty in differentiation between agranulocytic angina, aplastic anemia, and acute aleukemic leukemia, while the disease is in the aleukemic stage and before the immature white blood cells are thrown into the general circulation, is emphasized.

#### REFERENCES

1. Schultz, W.: Ueber eigenartige Halserkrankungen; A. Monozyten Angina. *Deutsch Med. Wehnschr.*, 1922, 48, 1495.
2. Blumer, G.: Agranulocytosis Blood Picture in Conditions Other Than Angina. *Am. J. Med. Sci.*, 1930, 179, 11.
3. Fox, H., and Farley, D.: Relation of Aleukemic Leukemia, So-called Psuedoleukemia and Malignant Granuloma. *Am. J. Med. Sci.*, 1922, 163, 313.
4. Pepper, O. H. P.: Agranulocytic Angina. *The Cyclopedia of Medicine Philadelphia*, F. H. Davis Co., 1931, 1, 244.
5. Kastlin, G. J.: Agranulocytic Angina. *Am. J. Med. Sci.*, 1927, 173, 799.
6. Roberts, S. R., and Kracke, R. R.: Agranulocytosis, etc. *Ann. Int. Med.*, 1931, 5, 40.
7. Dameshek, W., and Ingall, M.: Agranulocytosis (Malignant Neutropenia). *Am. J. Med. Sci.*, 1931, 181, 502.
8. Roberts, S. R., and Kracke, R. R.: Agranulocytosis. *Am. J. Med. Assn.*, 1930, 95, 780.
9. Schenck, H. P., and Pepper, O. H. P.: Concerning the Confusion Between Acute Leukemia and Infectious Mononucleosis. With case report. *J. Med. Sci.* 1926, 171, 320.
10. Sweeney, J. S.: Chronic Aplastic Anemia and Symptomatic Hemorrhagic Purpura Probably Due to Benzol Poisoning. *J. Med. Sci.*, 1928, 175, 317.
11. Thompson, W. P.: Leukopenia Resembling Agranulocytosis With Recovery. *J. Med. Sci.*, 1930, 180, 232.
12. Carey, J. B., and Taylor, J. H.: Primary Aplastic Anemia, a Discussion and Report of Two Cases. *Ann. Int. Med.*, 1931, 5, 471.
13. Ehrlich, P.: *Charité Ann.*, 1888, VIII, 300.
14. Duke, W. W.: Aplastic Anemia. *J. Am. Med. Assn.*, 1928, 91, 720.
15. Crawford, B. L., and Weiss, E.: Leukemia. *J. Am. Med. Assn.*, 1928, 90, 203.
16. Kastlin, G. J.: Agranulocytic Angina. *Am. J. Med. Sci.*, 1927, 173, 799.
17. Hunter, F. T.: Personal Correspondence.

# NAVAL RESERVE

## MEDICAL CORPS

### APPOINTMENTS, FIRST QUARTER, 1934

Name	Rank	Ap- pointed
Sutelan, Harry	Lieutenant commander, MC-V (S)	Jan. 2
Fulmer, Charles C	do	Jan. 3
Faunce, Calvin B	do	Jan. 9
McCann, William S	do	Jan. 19
Atkinson, Gordon D	do	Jan. 25
Chaffee, Burns S	do	Jan. 27
Roberts, Sumner Mead	do	Feb. 5
Michael, Joseph C	do	Feb. 15
Hudson Henry W	do	Feb. 27
Hepler, Alexander B	do	Feb. 28
Caldwell, Calvin N., Jr	do	Mar. 19
Sharpsteen, Jay R	do	Mar. 13
Green, Henry J	Lieutenant, MC-V (S)	Jan. 10
Whalman, Harold F	do	Feb. 27
Simpson, George W	do	Feb. 28
Lufkin, Nathaniel H	do	Mar. 2
Cooper, Kemp G	do	Mar. 7
Mandeville, Frederick B	do	Mar. 15
Miller, Hugo E	Lieutenant (junior grade), MC-V (S)	Mar. 16
Robinson, Nathaniel D	Lieutenant (junior grade), MC-V (G)	Jan. 5
Isquith, Julian R	do	Jan. 13
Hall, Frank McKinley	do	Jan. 23
Weaver, Harry S., Jr	do	Feb. 6
Soderstrom, Kenneth M	do	Feb. 10
Koonce, Donald B	do	Feb. 28
Cochran, Jesse L	do	Mar. 5
Bibler, Lester D	do	Mar. 12
Angelillo, Marc D	do	Mar. 14
Van Raalte, Leslie H	do	Mar. 17
Fulghum, James E	do	Mar. 2
Moore, Moore, Jr	do	Mar. 19

### PROMOTIONS

Name	From—	To—	Appointed
Liljencrantz, Eric	Lieutenant (junior grade), MC-F	Lieutenant commander, MC-V (S)	Dec. 19, 1933
Patterson, John K	Lieutenant (junior grade), MC-V (G)	Lieutenant, MC-V (G)	Feb. 2, 1934
Brecher, William	do	do	Jan. 13, 1934
Payne, DeWalt	do	do	Mar. 8, 1934

## DENTAL CORPS

### APPOINTMENTS LAST QUARTER

Name	Rank	Appointed
Clinchard, William H., Jr	Lieutenant (junior grade), DC-V (G), U.S.N.R.	Feb. 15, 1934
Gillis, Robert R	Lieutenant commander, DC-V (S), U.S.N.R.	Feb. 9, 1934
Hudson, Henry R	Lieutenant (junior grade), DC-V (G), U.S.N.R.	Mar. 6, 1934
Jacob, Thornton N	do	Feb. 14, 1934

### PROMOTIONS

Name	From—	To—
Koch, Clarence W	Lieutenant (junior grade), DC-V (S), U.S.N.R.	Lieutenant, DC-V (S), U.S.N.R.







THOMAS HARRIS.

1784- 1861.

The second Chief of the Bureau of Medicine and Surgery.

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## NOTES AND COMMENTS

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### THOMAS HARRIS

#### THE SECOND CHIEF OF THE BUREAU OF MEDICINE AND SURGERY

The second Chief of the Bureau of Medicine and Surgery, Thomas Harris, was born in East Whiteland, Chester County, Pa., on January 3, 1784. He came of fine old colonial stock. He graduated from the Medical School of the University of Pennsylvania on April 19, 1809, and was appointed a surgeon in the United States Navy on July 6 and accepted on July 20, 1812. On September 22 of that year he was ordered to the U.S.S. *Wasp* then commanded by Jacob Jones. He thus took part in the celebrated engagement between the *Wasp* and *H.M.S. Frolic* on October 18, in which the *Frolic* was captured. Later in the day the *Wasp* and her prize was taken by the British line of battleship *Poictiers* and carried into Bermuda. The officers and crew of the *Wasp* were shortly returned to the United States. Dr. Harris was one of those who received the thanks of Congress and the medal awarded to all officers who took part in this action.

His most important subsequent service was at Philadelphia where the first naval hospital there was built under his supervision; where he was for years president of the board to examine candidates for entrance or promotion in the Medical Corps; and where he organized and conducted a postgraduate medical school which was the first medical school in this country to give instruction in naval medicine and, in fact, was the real forerunner of our present Naval Medical School. He was one of the best known and most skillful surgeons of his day, and many distinguished civilians came to him for relief. In 1832, together with Dr. Triplett, he operated on President Jackson and extracted a bullet that had been received in a duel nearly 20 years before.

He was appointed Chief of the Bureau of Medicine and Surgery on April 1, 1844, and served until September 30, 1853. He brought about improvements in the organization of the newly formed Bureau during his administration and was much interested in the character and qualifications of the young medical men entering the Medical Corps of the Navy.

He died on March 4, 1861, at Philadelphia where he is buried.

**DENTAL OFFICER RECEIVES LETTER OF COMMENDATION**

Lieut. Commander Rufus A. Ferguson, Dental Corps, while stationed in American Samoa, made a most comprehensive dental survey of the school children in the Samoan Islands, which was published in the February 1934 issue of the Journal of the American Dental Association. When the natives ate their usual diet, which consisted largely of nuts, sea foods, and vegetable starches, there was a strikingly low incidence of dental disease. When the European diet, consisting of cereals, sugar, meats, and fruits that had been canned or otherwise preserved was used, there was a relatively high incidence of dental disease. There was also an intermediate group whose diet was a mixture of that of the native diet and the European, and this group tended to show an intermediate position also as to the condition of the teeth. This definite relation between nutrition and dental disease was nearly duplicated by a survey made in the island of Tristan da Cunha, a lonely spot in the South Atlantic. Dr. Ferguson's survey required travel throughout the various islands in the face of many discomforts and difficulties. He sustained a fracture of the arm while descending one of the mountain trails. The results of his work is a definite contribution to knowledge regarding the relation between nutrition and dental disease. He has received a letter of commendation from the Secretary of the Navy.

In connection with Dr. Ferguson's work, it is of interest to note the results expressed by Jones, Larsen, and Pritchard of the research department of Queens Hospital, Honolulu. They find that the use of taro, or sweetpotato, or a source of carbohydrates in place of those obtained from cereals appears to effect the arrest of dental decay.

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**NEW FORM OF MICROSCOPE WITH GREATLY INCREASED POWER OF MAGNIFICATION**

The Berlin Technical High School has just produced a scientific apparatus which if the claims made for it are justified will render the normal type of microscope obsolete by producing far greater enlargements. It is claimed that by it a degree of magnification approaching 25,000 times the actual size of the object can be obtained.

The instrument is not of an optical character, its results being reduced to the optical plane only in the final stage. Instead of ordinary light rays, cathode rays—electrons with a negative charge—are used.

These are diverted by means of electrical or magnetic fields from their normal path, and the research workers at the institute have now found a means of concentrating and dispersing them at will within given bounds.



Since cathode rays cannot be detected by the human eye, either directly or by the use of any other optical lens, resort is had in the new apparatus to photographic plates. The object to be viewed is subjected to an intensive discharge of rapidly flowing electrons controlled by means of condensers which serve the same purpose as the series of lenses in a normal microscope.

The "pictures" derived from this action are passed through two stages of magnification and are finally rendered visible on a plate or screen.

It is understood that a very similar instrument or an instrument operating on the same principle has been developed in England. It is not anticipated that the instrument, if finally proved of practical application, will displace ordinary microscopes in the fields in which they are now used but that it will have application in special fields.

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#### TRANSMISSION OF COMMON COLDS BY FOOD

In the Proceeding of the Society for Experimental Medicine and Biology, for October 1933, Bliss and Long demonstrated the possibility of the spread of common colds by food handled by persons suffering with acute infections of the upper respiratory tract. This experimental work was done with 15 apes who were kept for 3 months in strict quarantine. Attendants were free from colds, wore gowns, gloves, and masks, and food was prepared under aseptic conditions. Then a person suffering from a common cold prepared the food which was placed in aseptic containers, and carried by a masked, noninfected attendant and placed in the individual cubicles. Five of the experimental animals developed typical symptoms such as nasal discharge and obstruction, mouth breathing, slight fever, and leucocytosis, within 24 hours. Two developed a moderately severe cough. This evidence of the spread of colds by infected food handlers is of the greatest importance in attempts to control the incidence of these infections, particularly in military organizations where food handlers are under control of medical supervision.

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#### DANGERS OF DINTROPHENOL IN THE TREATMENT OF OBESITY

Methods of weight reduction all have their dangers, and the latest, the use of dintrophenol, must be used with caution, until further knowledge is obtained following its more extensive clinical use. The preliminary report on it made by the Council of Pharmacy and Chemistry emphasized its limitations and dangers. In the September 30, 1933, issue of the Journal of the American Medical Asso-

ciation, Anderson, Reed, and Emerson report use of dintrophenol in several cases of obesity with one very severe toxic reaction. At least one death has been reported from an overdose of the drug.

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#### PROTECTION AGAINST HEAT IN THE TROPICS

The question of the adaptability of the white man to the Tropics has been a most controversial matter. Hand in hand with the controversy goes the development of methods for protection against the excessive temperature and humidity encountered. Recently there have been suggestions that indicate some definite steps in advance and promise much for future developments in increasing the comfort of living conditions not only in the Tropics but in limiting the spread of so-called "wild heat" on board ship or in industrial plants. These developments therefore are of particular interest to naval medical officers.

The first of these promising improvements are the extremely practical suggestions made by Dr. G. P. Crowden before the Royal Society of Tropical Medicine. It has long been known that a bright surface radiates heat less rapidly compared to other surfaces and that air is a poor conductor of heat. Crowden showed that sun helmets, huts, or boxes could be insulated against heat most effectively by being provided with an air space containing a sheet of asbestos covered on both sides with metallic foil, such as aluminum foil. A block of 16 pounds of ice enclosed in a container insulated in this way had 7 pounds remaining after 23 hours' time while a similar block in an ordinary container under the same conditions had melted entirely. Tropical helmets insulated on this principle also were found to be 5° to 6° F. cooler under a tropical sun.

This work of Crowden has a counterpart in that of Thompson, reported in the Journal of the Royal Army Medical Corps for February 1934, who experimented with sheet aluminium alone as an insulator on board ship for bulkheads and as a covering of steam pipes with definite improvement of conditions. Further study along these lines are needed and would furnish an interesting field for some enterprising worker.

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#### ETIOLOGY OF PRIMARY GRANULOCYTOPENIA

The importance of caution in the use of newly discovered and exploited drugs is again brought home by the recent work of Madison and Squier published in the March 10, 1934, number of the Journal of the American Medical Association in which they make it practically certain that the cause of this new and hitherto puzzling

condition has been found. The cause is simple. It is apparently due to poisoning by drugs of the barbituric acid group, particularly amidopyrine, and especially amidopyrine with a barbiturate. This explains the frequency of the condition in doctors, nurses, pharmacists, and others familiar with these new drugs. In each of their 14 patients the onset of the disease was preceded by the use of amidopyrine either alone or in combination with a barbiturate. The mortality in six cases who continued the use of the drug was 100 per cent. In 8, in which it was discontinued, only 2 died and these in the initial attacks. Furthermore, the administration of the drug in two who had recovered was followed by a rapid fall in granulocytes. Experimental work on rabbits was confirmatory of this evidence that amidopyrine alone or in combination with a barbiturate is capable of producing granulocytopenia in individuals who have developed sensitivity to the drug. It is believed that the effect is produced through an allergic reaction. It is of interest to naval medical officers that a medical officer of the Reserve Corps of the Navy was one of the initial observers in this subject. Lieut. R. R. Krache, MC-V (G) in the January 1932 number of the American Journal of Clinical Pathology was one of the first to draw attention to the probability of a drug as basis for this condition and reproduced the clinical picture in animals with benzene, ortho-oxybenzoic acid, and hydroquinone.

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#### **CIVIL SERVICE COMMISSION RECOGNIZES HOSPITAL CORPS TECHNICIANS**

The Board of Civil Service Examiners has recently expressed willingness to accept certificates of graduation of Hospital Corps technical schools as partial qualifications for certain civil-service ratings.

The technical ratings affected are dental technicians and mechanics, laboratory, X-ray, and physical therapy.



## BOOK NOTICES

Publishers submitting books for review are requested to address them as follows:

The EDITOR, UNITED STATES NAVAL MEDICAL BULLETIN,  
*Bureau of Medicine and Surgery, Navy Department,*  
*Washington, D.C.*

**HYPERTENSION AND NEPHRITIS**, by Arthur M. Fishberg, M.D., *Associate Physician to Beth Israel Hospital; Associate in Medicine, Mount Sinai Hospital, New York City.* Third edition, thoroughly revised. Lea & Febiger, Philadelphia, 1934. Price, \$6.50.

As in the earlier editions of this work, the author has succeeded in simplifying a complicated subject so that it may be readily understood by the "family doctor", under whose care the majority of the victims of hypertension and nephritis remain throughout the course of their illness. Nevertheless, he has not failed to call attention to the newer knowledge of the subject, on the laboratory as well as the clinical side, and to apply it to practical use in diagnosis and treatment.

Many tests of renal function are mentioned, but the author considers the specific gravity test of greatest practical value. It certainly has the merit of simplicity. He does not consider it wise to combine the concentration test with the dilution test, as is done with such valuable results in the Naval Medical School laboratories.

The classification of Bright's disease adopted by Fishberg is that of Volhard and Fahr in which the types are degenerative, inflammatory, and arteriosclerotic or, in other terms, nephroses, nephritides, and scleroses. With some modification, this classification seems the best from a clinical standpoint.

The terms, "Epstein's nephrosis" and "lipoid nephrosis" are not used by the author, but he does give Epstein due credit for clarifying our knowledge of the condition so often identified with his name and for introducing a rational and effective treatment for chronic nephrosis.

In the discussion of the necrotizing nephrosis due to the ingestion of bichloride of mercury, a description of the modern treatment with saline solution is given. Nothing is said, however, about the use of hypertonic salt solution to combat the anuria so common in this condition.

The action and uses of salyrgan as a diuretic are described in detail and its value recognized. Its use in the presence of severe impairment of kidney function is condemned.

The chapters on essential hypertension are complete and illuminating. Very sensibly, the author warns against overemphasizing the danger of high blood pressure to a patient without symptoms but recognizes the importance of the proper treatment of hypertension when it is accompanied by signs of myocardial insufficiency. In these cases the proper treatment consists principally of rest and digitalis. The use of drugs to lower the pressure has not been found by the author to be very satisfactory.

An extensive bibliography is appended to each chapter.

In the opinion of the reviewer, this is a valuable book which should be available to all naval medical officers for reference and study.

**ALLERGY IN GENERAL PRACTICE**, by *Samuel M. Feinberg, M.D., F.A.C.P.* Lea & Febiger, Philadelphia, 1934. Price \$4.50.

This book was written for the general practitioner and is therefore a departure from other books in this field which have been written more for the use of those doing research work on allergy or engaged in specialized practice. There are said to be 2,000,000 sufferers from hay fever and asthma in the United States alone, it is obvious that the treatment of most of these cases must be by the average physician in general practice. Dr. Feinberg designed his book as a guide for them.

After a brief summary of the manifestation of allergy, he goes with little preamble into the subject of asthma and takes it up under constitutional predisposition, heredity sensitization, secondary or precipitating cause, contributing causes, and finally specific causes such as foods, animal dandruffs, bacteria, pollens, micellaneous substances, physical allergy, drugs, and sera. This is followed by a most practical description of the methods of examination and the making of the tests for specific cases, and the treatment. Hay fever is taken up in the same way and there is then a chapter devoted to other allergic disorders such as urticaria, angioneurotic edema, eczema, as well as such conditions as migraine, epilepsy, and other conditions in which allergy is strongly incriminated as a cause. In conclusion, are given 39 actual cases of all varieties showing the various problems of diagnosis and management in a most practical manner. The book is illustrated, 23 engravings and a colored plate. There are a number of maps showing pollen distribution in the United States. Altogether, a valuable book.

**LABORATORY MEDICINE**, by *Daniel Nicholson, M.D., Member of the Royal College of Physicians, London; Assistant Professor of Pathology, University of Manitoba; Assistant in Pathology, Winnipeg General Hospital.* Second edition. Lea & Febiger, Philadelphia, 1934. Price, \$6.50.

The second edition of this highly informative manual has been increased in size from a total of 433 pages in the first to 566 pages.

in the second edition. This increase in size was necessitated by the enormous amount of new material added, the most important of which was "pneumococcus typing by the rapid capsular reaction, quantitative agglutination tests, urea clearance, and urine concentration tests."

The rearrangement bringing up to date the chapters dealing on routine and special hematology is an excellent improvement.

The selection of the tests in this book, on the whole, are good, well arranged, and the interpretation of the tests conservative in nature.

This book on laboratory medicine is excellent, full of meat, and could be utilized to advantage by anyone doing his own laboratory work, as well as those who have their laboratory work performed for them.

This book is highly recommended not only to the student of medicine but to the clinician as a companion volume to his textbook on the practice of medicine.

It could be read to advantage not only from an educational standpoint but as a time saver for those contemplating a post-graduate course in medicine. By so doing, they would enter upon the course with a familiarity of the newer tests and their interpretations which are so frequently mentioned by the internist without explanation. Unless the student knows the test, its clinical application and interpretation, he remains bewildered as to the rapidity with which the diagnosis was established.

**TREATMENT IN GENERAL PRACTICE**, by *Harry Beckman, M.D.* W. B. Saunders Co., Philadelphia. Price \$10.

After all, it is the general practitioner who bears the heat and burden of the day, and the popularity of books written primarily for his use attests the desire of the family doctor to avail himself of the best advice from the specialists in his profession who put their knowledge in print for his use. The publishers of Dr. Beckman's book state that it was back for reprinting in only 4 weeks, with a 50 percent increase in number of copies printed, then back again for a third printing twice the size of the original issue, followed by a fourth and a fifth. This was in 1930, and now, as the demand continues, the book has been revised. This is not surprising when the work is examined. The treatment for each condition is given in the most practical manner, and includes not only drugs but nursing care, diet, prevention of complications, sequelae, and recurrences. There are many hundreds of prescriptions written out fully with sound advice as to their administration. Every effort of the author has been directed toward making the book a useful guide to the general practitioner.

**DIABETIC MANUAL**, by *Elliot P. Joslin, M.D.* *Fifth edition.* Lea & Febiger, Philadelphia, 1934. Price \$2.

This guide for the "mutual use of doctor and patient", as Dr. Joslin so happily put it, is almost too well known and valuable to need further notice to the medical profession. This edition has been thoroughly revised, however, and brought up to date without doing what is so often done with a good book in this process, deleting the features that made it valuable. The relation between obesity and diabetes is emphasized. Throughout the book the encouraging anecdotes and interesting and instructive pictures found in previous editions have been retained.

**PRACTICAL ANESTHESIA FOR DENTAL AND ORAL SURGERY**, by *Harry M. Seldin, D.D.S.*, Lea & Febiger, Philadelphia, 1934. Price \$7.50.

This book thoroughly covers the subjects of both local and general anesthesia as applied to the practice of dentistry and should be very valuable as a text and reference for students and practitioners. The material is systematically arranged and tabulated and clearly presented. The section on anatomical considerations is done with unusual clarity, and the many illustrations were excellent, particularly the photographs of wet dissections.

In the chapter on "Anesthetic Solutions" most of the forms of local anesthetics generally in use are intelligently presented, their relative merits and demerits being discussed. However, there is no mention of the tablets which combine anesthetic and vasoconstricting agents with salts in proper amounts to give isotonic and isosmotic solutions when added to distilled water. The subject of buffered solutions is considered in a rather extensive quotation from the report of Charles W. Freeman.

The whole range of injections for inducing local anesthesia in the maxillae and mandible are clearly described and well illustrated. The author gives three techniques for the inferior dental injection, and critical evaluation of each. The various forms of infiltration are intelligently described and intelligently discussed. While all of the possible nerve block injections by both intraoral and extraoral routes are fully described and indications for their uses given, the author takes the conservative and practical view that where infiltration will give satisfactory anesthesia, as for extraction of mandibular incisors and of single teeth in the maxillae, it is the anesthesia of choice unless contraindicated, as in acute inflammatory conditions. The use of the incisive nerve (mental) injection is discouraged and very good reasons are presented for this attitude.

In the detailed descriptions of techniques for the various injections, there appears a tendency to repetition, but this is no doubt intentional, with a view toward emphasizing on the mind of the student



the importance of thoroughly understood, accurately executed technique.

There is a chapter on complications of local anesthesia, giving symptoms, causes, and treatment, arranged in such a way as to be easily referred to.

In part II, the various forms of general anesthesia are considered in detail and there are chapters devoted to physical diagnosis, physiology of inhalation anesthesia, and techniques for administration which appear to cover the subject in a thorough and practical manner.



## THE DIVISION OF PREVENTIVE MEDICINE

S. S. COOK, Lieutenant Commander, Medical Corps, United States Navy, in charge

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### SWIMMING POOLS

At this season of the year when indoor and outdoor artificial swimming pools are being widely used it seems timely to publish regulations for their care and upkeep. Those of the Michigan Department of Health are representative and conform to modern public health practice. Medical officers can doubtless obtain similar rules from the nearest state or city department of health.

The following is quoted from Engineering Bulletin No. 18, January 1, 1932, Michigan Department of Health:

#### RULES FOR USERS OF THE POOL

(1) A thorough cleansing bath with warm water and soap and without a suit shall be taken before the swimmer enters the pool. All soapsuds must be thoroughly rinsed from the body before the suit is put on.

(2) Anyone using the toilet or urinal shall wash with soap in the showers before entering the pool, even though a bath has been taken.

(3) Each user of the pool shall report to the swimming instructor or attendant after bathing and before entering the pool.

(4) At indoor and outdoor pools when suits are used, they shall be of cotton. Gray-colored suits are recommended. If suits of other colors are used, the dyes must be fast. (Heavy woolen suits shed lint and cannot be kept as clean as the lighter cotton suits.)

(5) Where privately owned bathing suits and towels are used, it shall be the duty of the bathhouse attendant to see that the suits and towels are clean and dry before the bathers are admitted to the pool.

(6) Persons with colds, boils, skin eruptions, inflamed eyes, or similar infections shall be refused admittance by the swimming instructor or attendant. Persons who have any conditions that may be communicable will be referred to a physician by the swimming instructor.

(7) Persons wearing bandages or corn plasters shall be refused admittance.

(8) All persons with blistering, peeling, wart, or wartlike conditions on the feet shall be excluded from the pool, the showers, and the locker room.

(9) Chewing gum, spitting, spouting of water, blowing the nose, or otherwise polluting the pool water is forbidden. If it is necessary to spit, do so in the scum gutter near one of the gutter outlets. (Violent blowing of the nose to remove water is likely to force infectious matter into the sinus and inner ear cavities and possibly cause serious consequences.)

(10) Persons failing to comply with any of the above regulations shall be refused admittance to the pool.

(11) After leaving the pool be sure to thoroughly dry the body before dressing.

#### RESPONSIBILITIES OF SWIMMING INSTRUCTORS AND ATTENDANTS

Swimming instructors and attendants shall—

(1) See that all the rules and regulations affecting the users of the pool are properly carried out.

(2) Interpret to classes all "Rules for users of the pool." (Quoted above.)

(3) See that showers are operated properly and that each user of the pool takes a warm soap shower without suit before entering pool.

(4) Inspect all users of the pool, after they have bathed and before they enter the pool, to see that the bath has been properly taken and that each user is free from colds, skin infections, or other ailments enumerated under "Rules for users of the pool."

(5) Refuse admittance to any user of the pool who fails to live up to the requirements or who is not clean, or who has a cold, boils, skin infection, or other ailments which might be detrimental to other users of the pool or to the condition of the water in the pool.

(6) Be responsible for the cleanliness of suits and towels.

(7) Report to the engineer any condition of the pool which may be detrimental to its efficient operation.

(8) Use every effort to prevent the tracking of dirt into the pool room, the bathers being required to wash their feet before entering the pool, and to bar from the pool room or enclosure all persons in street clothes or shoes except those whose duty it is to be there.

(9) See that all doors to the pool room are locked when the pool is not in use.

(10) Be responsible for the safety of the users of the pool at all times.

(11) Remain at the pool throughout the swimming period unless another person qualified for the responsibility has reported to assume charge.

(12) Be dressed suitably to enter the water and act in an emergency.

(13) Be familiar with methods of resuscitation.

(14) Be responsible for maintaining a high standard of conduct and personal habits among all users of the pool while in the locker rooms, showers, and pool.

(15) See that all privately owned bathing suits and towels are removed from the locker rooms after being used.

(16) Post in a conspicuous place a placard of rules for bathers and fill out such portions of the swimming pool report as apply to his or her work.

#### GENERAL REGULATIONS

(a) *Temperature and heating standards.*—(1) The temperature of the water of the indoor pool should not be under 72° F. nor over 78°. At outdoor pools water temperature is difficult to control. It should never exceed 85° F.

(2) The temperature of the air in the pool room should be not less than 3° warmer than the temperature of the water and should not exceed 82° F. (During the summer the outside conditions may necessitate an increase of this maximum temperature.)

(3) If the temperature of either water or air fails to come within the limits given above, the pool should not be used until the temperatures have been brought within the required range.

(b) *Bacterial standards.*—All samples of pool water shall show total bacterial counts not to exceed 200 colonies per cubic centimeter and no organisms of the *B. coli* group.

(c) *Residual chlorine tests.*—In every pool where chlorine or chlorine compounds are used an orthotolidin testing set for making free chlorine determinations shall be provided and there shall be on duty at all times when the pool is in use at least one person whose duty it shall be to make and record frequent tests. Records of tests shall be kept for the department of health and tests shall be made often enough to insure sufficient free chlorine in pool at all times. It is recommended that the residual chlorine content be maintained between 0.2 and 0.5 parts per million.

(d) *Alkalinity.*—A pool water must always show a slight alkalinity. Alum has a slight acid reaction. Its continuous application to a pool water may change the water's natural alkalinity to a slight acidity, which would cause irritation of the mucous membranes of the bathers. No more alum should be used than is strictly necessary. Ordinarily a 15-minute application of alum after each filter washing is sufficient.

(e) *Regulations.*—Copies of these regulations should be in the hands of all persons in responsible charge of artificial swimming pools.

(f) *Bathing suits and towels.*—All suits and towels shall be washed with soap and boiling water, rinsed, and thoroughly dried

each time they are used. Cold water washing and air drying is prohibited. The use of a disinfectant on suits and towels is a make-shift and cannot be recommended. Clean suits and towels must be kept strictly separated from those which have been used and are still unlaundered, and must not be stored on shelves, handled in baskets, or passed out over counters where dirty suits have been placed.

(g) *Foot bath for skin diseases.*—The prevalence of skin diseases of the feet at all pools requires immediate attention if we are to prevent their spreading. Possibly the simplest way to control infection among swimmers is to provide foot baths containing 0.5 to 1 percent sodium hypochlorite solution in which every swimmer must immerse his feet for 15 seconds or longer before entering the pool room. The solution in the foot baths must be renewed each day, the old solution being used to disinfect the floors of the locker, toilet, shower, and pool rooms. If there are no built-in foot baths available at the pool, one-piece rubber ones may be purchased or wooden ones built. They should be about 2 or 2½ feet square and about 4 inches deep. If wooden ones are provided it is necessary that the bottom be covered with a rubber mat to prevent slipping.

With the exclusion from the pool and locker rooms of the obvious cases of foot skin infections and with the use of the foot bath prophylaxis these diseases may be controlled.

#### HEALTH OF THE NAVY

Statistical returns for the last quarter of 1933 gave a low general admission rate—470.80 per 1,000, as compared with an expected rate of 556.66 for this quarter. The admission rate for disease was 402.05 per 1,000, as compared with 502.12, the 5-year median for the corresponding 3 months. This rate is slightly lower than the rate for the preceding quarter. The admission rate from accidental injuries showed an increase when compared with the 5-year median and with the rate for the previous year. The greatest increase was noted for injuries occurring within command but not associated with work.

The incidence of acute respiratory diseases was a little less than the experience of the corresponding months of the last 5 years, but, as was to be expected, a little greater than the previous quarter. Cases of these diseases (Vincent's angina; bronchitis, acute; catarrhal fever; and tonsillitis, acute) were reported as follows: Naval Training Station, San Diego, Calif., 240; Naval Training Station, Norfolk, Va., 95; Marine Barracks, Quantico, Va., 72; Marine Corps Base, San Diego, Calif., 33; and Naval Air Station, San Diego, Calif., 29. Scattered cases appeared among personnel at other shore stations during the quarter. The Naval Training Station, San

Diego, Calif., reported 5 cases of measles in November and 10 cases in December. The medical officer of this station stated that the health of the station personnel was good and that the increase in catarrhal fever cases was seasonable and to be expected in view of the large complement.

There were 308 admissions for these diseases reported by foreign shore stations, of which 53 occurred in the First Brigade, United States Marine Corps, Port au Prince, Haiti, and 45 in the Fourth Marines, Shanghai, China. The latter also reported 2 cases of typhoid fever, 1 in October and 1 in December.

The admission rate, all causes, for forces afloat was 405 per 1,000 per annum. The median rate for the fourth quarter of the preceding 5 years is 524. There were 1,528 cases of acute respiratory diseases reported by all ships of the Navy during October, November, and December, indicating a 10-percent decrease from the number of cases notified for the preceding quarter and an incidence a little below expectancy for this season of the year. Ships reporting 20 or more cases during the quarter are as follows: U.S.S. *Mississippi*, 34; U.S.S. *Arkansas*, 31; U.S.S. *Arizona*, 27; U.S.S. *Wyoming*, 27; U.S.S. *Nevada*, 24; U.S.S. *New Mexico*, 23; U.S.S. *Saratoga*, 23; U.S.S. *Oklahoma*, 21; U.S.S. *Portland*, 21; and U.S.S. *New York*, 20. The U.S.S. *Pennsylvania* reported 32 cases of mumps, the majority of cases occurring among marines, and the U.S.S. *California* reported 12 cases. Three cases of chickenpox were reported by the U.S.S. *Isabel*, 1 in November and 2 in December, and 1 case by the U.S.S. *Louisville* in October.

#### ADMISSIONS FOR INJURIES AND POISONINGS, FOURTH QUARTER, 1933

The following table, indicating the frequency of occurrence of accidental injuries and poisonings in the Navy during the fourth quarter, 1933, is based upon all form F cards covering admission in those months which have reached the Bureau:

	Admissions, October, November, and Decem- ber 1933	Admission rate per 100,000, per annum	Admission rate per 100,000, year 1932
<b>INJURIES</b>			
Connected with work or drill.....	673	2,548	2,440
Occurring within command but not associated with work.....	595	2,252	1,675
Incurred on leave or liberty or while absent without leave.....	533	2,018	1,900
All injuries.....	1,801	6,818	6,015
<b>POISONINGS</b>			
Industrial poisoning.....	5	19	8
Occurring within command but not connected with work.....	5	19	63
Associated with leave, liberty, or absence without leave.....	5	19	17
Poisonings, all forms.....	15	57	93
Total injuries and poisonings.....	1,816	6,875	6,108

## PERCENTAGE RELATIONSHIPS

	Occurring within command				Occurring outside command	
	Connected with the performance of work, drill, etc.		Not connected with work or prescribed duty		Leave, liberty, or A.W.O.L.	
	October, November, and December 1933	Year 1932	October, November, and December 1933	Year 1932	October, November, and December 1933	Year 1932
Percent of all injuries.....	37.4	40.6	33.0	27.8	30.6	31.6
Percent of poisonings.....	33.3	8.7	33.3	72.8	33.3	18.5
Percent of total admissions, injury and poisoning titles.....	37.3	40.1	33.0	28.5	29.7	31.4

Poisoning by a narcotic drug or by ethyl alcohol is recorded under the title "Drug addiction" or "Alcoholism", as the case may be. Such cases are not included in the above figures.

The following cases, selected from October, November, and December 1933 reports, are worthy of notice from the standpoint of accident prevention:

While working on an automobile the trousers of a hospital apprentice became saturated with gasoline which was ignited when a lighted match was thrown down by another man. Both legs were burned. Result was 44 days in a hospital.

Gasoline on the dungarees of a machinist's mate, first class, was ignited by a match dropped after lighting a cigarette. Both hands and one leg were burned. Loss of time, 39 days aboard a hospital ship.

While cleaning clothing with gasoline, someone lighted a match resulting in a fire in which the face and hands of a chief boatswain's mate were burned. He spent 44 days in a hospital.

The arm of a yeoman, first class, and the face and hand of a seaman, first class, were burned when someone lighted a match while clothing was being cleaned with gasoline. The yeoman was on the sick list for 6 days and the seaman for 7 days.

A lighted match was thrown into an open can of gasoline which had been left on deck. As a result a seaman, second class, spent 64 days on the sick list with a burned hand.

While pouring gasoline into a tank from a can, a radioman, third class, spilled some on one trouser leg. He lighted a cigarette and a burn of the leg resulted when the spilled gasoline ignited. Loss of time, 5 sick days.

A seaman, second class, wearing trousers wet with gasoline, received a chemical burn in the inguinal region which resulted in the loss of 3 days.



# STATISTICS RELATIVE TO MENTAL AND PHYSICAL QUALIFICATIONS OF RECRUITS

The following statistics were taken from the monthly sanitary reports submitted by naval training stations.

October, November, and December 1933	United States Naval Training Station	
	Hampton Roads, Va.	San Diego, Calif.
Recruits received during the period.....	1,234	1,901
Recruits appearing before board of medical survey.....	16	0
Recruits recommended for discharge from the service.....	16	0
Recruits discharged by reason of medical survey.....	13	0
Recruits held over pending further observation.....	0	0
Recruits transferred to the hospital for treatment, operation, or further observation for conditions existing prior to enlistment.....	4	51

The following table was prepared from reports of medical surveys in which disabilities or disease causing the surveys were noted as existing prior to enlistment. The time which elapsed from date of enlistment to date of medical survey is noted in each case. With certain diseases, survey followed enlistment so rapidly that it would seem that many might have been eliminated in the recruiting office. The difficulty in establishing a diagnosis in nervous and mental cases is demonstrated by the time interval in the table. An exception in this group is epilepsy which may or may not diagnose itself promptly. Certain groups, of course, present difficulties in diagnosis at the time of enlistment due to lack of equipment.

Cause of survey:	Number of days between enlistment and survey
Absence, acquired, teeth.....	14
Do.....	10
Amblyopia.....	78
Ankylosis, second and third lumbar vertebrae.....	11
Anomaly of form, spine.....	28
Arterial hypertension.....	211
Astigmatism.....	91
Do.....	14
Do.....	14
Astigmatism, right eye.....	6
Astigmatism, hyperopic, both eyes.....	4
Cardiac arrhythmia, extra systole.....	112
Cicatrix, skin, left middle finger.....	8
Color blindness.....	41
Do.....	15
Do.....	15
Do.....	8
Do.....	5
Do.....	2
Constitutional psychopathic inferiority, without psychosis.....	225
Do.....	186
Do.....	81
Do.....	21
Constitutional psychopathic state, emotional instability.....	244
Constitutional psychopathic state, inadequate personality.....	120
Deafness, bilateral.....	57
Do.....	56

## Cause of survey—Continued.

Number of days between  
enlistment and survey

Deafness, unilateral.....	2
Deformity, acquired, left elbow.....	7
Deformity, acquired, right index finger.....	207
Deviation, nasal septum.....	206
Do.....	5
Do.....	4
Effort syndrome.....	236
Enuresis.....	259
Do.....	223
Do.....	14
Epilepsy.....	48
Flat foot.....	23
Do.....	11
Do.....	8
Fracture, simple, fifth and sixth cervical vertebrae.....	216
Gonococcus infection, prostate.....	112
Gonococcus infection, urethra.....	140
Do.....	57
Do.....	43
Do.....	34
Do.....	33
Do.....	14
Do.....	3
Hernia, inguinal, right.....	8
Hyperthyroidism.....	85
Lymphadenitis, neck.....	41
Malformation, congenital.....	81
Malocclusion, teeth.....	6
Metatarsalgia.....	209
Myopia.....	13
Do.....	13
Orchitis, chronic, nonvenereal.....	115
Otitis, interna, right ear.....	6
Otitis, media, chronic.....	19
Otitis, media, chronic (catarrhal).....	10
Paralysis, nerve, facial, right, old.....	15
Paralysis, nerve, right, facial.....	67
Perforated nasal septum.....	4
Psychoneurosis, hysteria.....	250
Do.....	110
Do.....	19
Rhinitis, atrophic.....	89
Do.....	57
Do.....	34
Sinusitis, maxillary.....	34
Valvular heart disease, mitral insufficiency.....	56
Do.....	15

TABLE 1.—Summary of morbidity in the United States Navy for the quarter ended Dec. 31, 1933

Average strength	Forces afloat, 71,320		Forces ashore, 34,339		Entire Navy, 105,659	
	Admis- sions	Rate per 1,000	Admis- sions	Rate per 1,000	Admis- sions	Rate per 1,000
All causes.....	7,216	404.71	5,220	608.05	12,436	470.80
Disease only.....	6,133	343.97	4,487	522.67	10,620	402.05
Injuries.....	1,072	60.12	729	84.92	1,801	68.18
Poisonings.....	11	.62	4	.46	15	.57
Communicable diseases, exclusive of venereal diseases:						
A.....	163	9.14	73	8.50	236	8.93
B.....	1,528	85.70	1,358	158.19	2,886	109.26
Venereal diseases.....	1,783	100.00	564	65.70	2,347	88.85

TABLE 2.—Deaths reported, entire Navy, during the quarter ended Dec. 31, 1933

Cause—disease		Navy			Marine Corps		Nurse Corps	Total
Primary	Secondary or contributory	Officers	Mid-shipmen	Men	Officers	Men		
Average strength.....		9,387	1,677	77,963	1,178	15,063	391	105,659
Abcess:								
Appendiceal.....	Embolism, pulmonary.....			1				1
Periodontal.....	Abscess, brain.....	1						1
Angina pectoris.....	Arteriosclerosis, general.....	1						1
Aneurysm, aorta.....	Pneumonia, broncho.....			1				1
Appendicitis, acute.....	Peritonitis, general, acute.....			2				2
Cerebrospinal fever.....	None.....			1				1
Cirrhosis, liver.....	Endocarditis, acute.....			1				1
Dilatation, cardiac, acute.....	None.....			1				1
Embolism:								
Cerebral.....	Phlebitis.....			1				1
Pulmonary.....	Ulcer, skin, leg.....			1				1
Endocarditis, acute.....	None.....					2		2
Hernia, ventral.....	Pneumonia, broncho.....	1						1
Hodgkin's disease.....	None.....			1				1
Hemorrhage, cerebral.....	Arteriosclerosis, cerebral.....			1				1
Myocarditis, chronic.....	Thrombosis, coronary.....	2						2
Do.....	Coronary sclerosis.....				1			1
Nephritis, chronic.....	Hemorrhage, cerebral.....			1				1
Do.....	Pneumonia, broncho.....			2				2
Obstruction, intestinal, from external causes.....	None.....			2				2
Otitis, media, acute.....	Meningitis, cerebrospinal, acute.....			1				1
Pneumonia, broncho.....	Abscess, peritonsillar.....			1				1
Do.....	Nephritis, acute.....					1		1
Do.....	Pyelonephritis.....					1		1
Pneumonia, lobar.....	None.....			1				1
Do.....	Abscess, lung.....			1				1
Do.....	Psychosis, manic depressive.....					1		1
Do.....	Valvular heart disease, aortic insufficiency.....					1		1
Rupture, nontraumatic, heart.....	Thrombosis, coronary artery.....	1						1
Sarcoma:								
Humerus.....	None.....					1		1
Tibia and lungs.....	Sarcoma, diaphragm and inguinal glands.....			1				1
Septicemia.....	Infarction, lung.....			1				1
Stricture, urethral.....	Uremia.....			1				1
Thrombosis, coronary.....	None.....					1		1
Tonsillitis, acute.....	Abscess, lungs.....			1				1
Tuberculosis, pulmonary, chronic.....	None.....			1				1
Tumor, malignant, liver.....	None.....	1						1
Valvular heart disease, combined lesions, mitral and aortic.....	None.....					1		1
Total for disease.....		7		25	1	9		42
INJURIES AND POISONINGS								
Asphyxiation (alcoholic vapor).....	None.....			1				1
Avulsion, arm.....	Aerogenes capsulatus infection.....			1				1
Burn, multiple.....	None.....			1				1
Crush, head.....	None.....			1				1
Drowning.....	None.....	1		7		1		9
Fracture, compound, skull.....	None.....	2		2				4
Do.....	Intracranial injury.....			1		1		2
Fracture, simple, skull.....	Hemorrhage, traumatic.....			2		1		3
Fracture, simple, vertebra, cervical.....	None.....			1				1
Injuries, multiple extreme.....	None.....	4		5				9
Intracranial injury.....	None.....			1				1
Wound, gunshot:								
Chest.....	None.....					1		1
Head.....	None.....					1		1
Wound, punctured abdomen.....	Peritonitis, general, acute.....					1		1

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TABLE 2.—Deaths reported, entire Navy, during the quarter ended Dec. 31, 1933—Continued

Cause—disease		Navy			Marine Corps		Nurse Corps	Total
Primary	Secondary or contributory	Officers	Midshipmen	Men	Officers	Men		
INJURIES AND POISONINGS—continued								
Poisoning:								
Barbital.....	None.....			1				1
Carbon monoxide, acute.	None.....			1				1
Neoparsphenamine, acute.	Nephritis, acute.....			1				1
Total for injuries and poisonings.....		7		26		6		39
Grand total.....		14		51	1	15		81
Annual death rate per 1,000:								
All causes.....		5.97		2.62	3.40	3.98		3.07
Disease only.....		2.56		1.28	3.40	2.39		1.59
Drowning.....		.43		.36		.27		.34
Poisoning.....				.15				.11
All other injuries.....		2.98		.82		1.33		1.02

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# UNITED STATES NAVAL MEDICAL BULLETIN

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NAVY DEPARTMENT,  
*Washington, March 20, 1907.*

This UNITED STATES NAVAL MEDICAL BULLETIN is published by direction of the Department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,  
*Acting Secretary.*

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Owing to the exhaustion of certain numbers of the BULLETIN and the frequent demands from libraries, etc., for copies to complete their files, the return of any of the following issues will be greatly appreciated:

Volume IX, no. 1, January 1915.  
Volume X, no. 2, April 1916.  
Volume XI, no. 3, July 1917.  
Volume XII, no. 1, January 1918.  
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## PREFACE

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The UNITED STATES NAVAL MEDICAL BULLETIN was first issued in April 1907 as a means of supplying medical officers of the United States Navy with information regarding the advances which are continually being made in the medical sciences, and as a medium for the publication of accounts of special researches, observations, or experiences of individual medical officers.

It is the aim of the Bureau of Medicine and Surgery to furnish in each issue special articles relating to naval medicine, descriptions of suggested devices, clinical notes on interesting cases, editorial comment on current medical literature of special professional interest to the naval medical officer, and reports from various sources, notes, and comments on topics of medical interest.

The Bureau extends an invitation to all medical and dental officers to prepare and forward, with a view to publication, contributions on subjects of interest to naval medical officers.

In order that each service contributor may receive due credit for his efforts in preparing matter for the BULLETIN of distinct originality and special merit, the Surgeon General of the Navy will send a letter of commendation to authors of papers of outstanding merit.

The Bureau does not necessarily undertake to endorse all views or opinions which may be expressed in the pages of this publication.

P. S. ROSSITER,  
*Surgeon General, United States Navy.*

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# U.S. NAVAL MEDICAL BULLETIN

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## SPECIAL ARTICLES

### SYPHILIS IN THE NAVY

By ROBERT P. PARSONS, Lieutenant Commander, Medical Corps, United States Navy

If we stop to consider what makes a disease important, it becomes quickly obvious that syphilis ranks easily as the most important disease in the Navy. Importance depends essentially on the factors of incidence and seriousness. The seriousness of syphilis would not give us such great concern were it not for its commonness and its commonness would not be so great a problem were it not for its seriousness. The two factors together qualify the disease by a wide margin as Public Enemy No. 1 in the Navy.

Besides being a disease of high incidence, and a disabling, crippling, killing, and demoralizing disease, syphilis has other features that contribute, or should contribute, toward the engagement of our interest. While being the most protean, in its manifestations, of all diseases, yet it follows perhaps more exactly than most other diseases its own code of immunology, so that in any given case it is possible to predict with quite good precision what the outcome is going to be, and one can now lay quite definite odds in any given large group as to what percent will fall by this or that form of syphilitic calamity and what percent will come through virtually unscathed. In no other disease do we have more remarkable aids in the fields of diagnosis and treatment. In no other disease are there such fascinating diagnostic problems or such intriguing means of solving them. In no other disease do we find more exact relationship between treatment and clinical course. Nowhere else are the results of treatment more obvious and quick—and gratifying.

Since prognosis in all its phases (those of cure, recurrence of lesions, serological reversal, number of sick days, development of neuro and cardiovascular forms of lesions, etc.) is so closely dependent on all phases of treatment (time when started, amount, kind, intervals of administration, etc.), our two goals in the Navy should be early diagnosis and good treatment. In plain words, our duty is to hit early and hit hard.

If we take stock of our annual statistics in these matters and subject ourselves to some rigid and critical self-examination, the effect of turning on the light should be a wholesome one.

The last annual report of the Surgeon General, that for the calendar year 1932, contains figures that involve some very sad commentaries on naval medical practice in syphilis, though at the same time, if compared with the corresponding figures for the 15 previous years, they present much encouragement and indicate a decided trend toward a higher score, both as to early diagnosis and as to percentage of infections diagnosed. Also, they indicate a most gratifying progress toward the goal of adequate treatment.

In 1932 there were 2,722 admissions for "chancroid" exclusive of those later changed to syphilis. Now, we know that real chancroid is such a rare thing in this country that we can consider it practically nonexistent. About 90 percent of all genital sores turn out to be syphilitic, the remaining 10 percent being made up chiefly of scabies, herpes, furuncles, and abrasions. The real incidence ratio of syphilitic to chancroidal sores in this country is several hundred to one. But the annual report gives 3,062 admissions for syphilis (with 56,051 sick days) as against 2,722 for chancroid (with 15,363 sick days). This invites the estimate that of the 2,722 chancroids at least 2,600 were really syphilis, and that the real Navy incidence of syphilis is about 6,000 new infections per year (with about 70,000 sick days).

Thus, the "chancroid" column in our statistics indicates that our score in early diagnosis of syphilis is only about 50 percent as good as it should be. Extragenital primary sores, which comprise about 10 percent of all primary syphilitic sores, are responsible for a further lowering of our efficiency mark. My observation has been that these lesions are diagnosed only exceptionally in the seronegative period and that their true nature is rarely suspected either by patient or doctor until the secondary rash and other secondary manifestations appear. If the patient is unfortunate enough to have inconspicuous secondary lesions and mild or indefinite subjective symptoms, months or even years may pass before the diagnosis is made. Cases of this sort are an almost daily experience in any large syphilis clinic. To illustrate, a case was recently seen in which a diagnosis of "mumps" was made some 10 weeks earlier by a medical officer on a battleship. The medical officer in question, incidentally, has had an unusually wide experience in syphilis and has a well-deserved reputation for being an exceptionally able syphilologist. The patient had a large swelling in the parotid area, and a quite conspicuous indurated ulcer over the middle of the forehead. The patient was transferred to the U.S.S. *Relief*, where he remained in the contagious ward about 2 weeks during which, through an unusual set of circumstances, no routine Kahn was done and the patient was not seen by the syphilis department. He was then transferred to the San Diego Naval Hospital, where again he was placed in the con-

tagious ward, still with the diagnosis of mumps. For some reason, not understood—and this also is most unusual—no routine Kahn was done at the hospital for several weeks. About 5 weeks after arrival at the hospital, the “mumps” swelling still being present, the diagnosis was changed to “lymphadenitis” and the patient transferred to the surgical ward. Here, a week later, on the routine weekly Kahn day, a routine Kahn was done. The four plus result led to a consultation with the syphilis department, where the first thing to be noted was the recently healed chancre on the forehead.

It goes without saying (after what has been mentioned here about the erroneous diagnoses of chancroid) that it is also an almost daily incident in any large Navy syphilis clinic to discover a case of late and serious syphilis (neuro, cardiovascular, bone, extensive late skin lesions, etc.) in which the diagnosis of chancroid had been made from many months to many years previously, with no indication in the health record or by the patient's history that any attempt had been made, after the healing of the primary sore, to clear up the question of possible syphilitic infection.

Another cut comes through a circumstance of syphilis not generally known and for which the doctor is not especially to blame. This is the fact that an indeterminate percentage of syphilitic infections occur without any primary sore that can be recognized as such. In these cases the secondary lesions and early subjective symptoms are also apt to be very inconspicuous and the clinical courses may for the most part be placed in the group of latent syphilis. The incidence of this type of infection has been variously estimated by different authorities, but those who are in the best positions to judge are those who place the figure the highest and these think that it is about 20 percent of all syphilitic infections. This type of infection accounts for the many hospital patients admitted for other conditions, whose routine Kahns are four plus and remain so until considerable treatment has been received.

So, between those erroneously diagnosed chancroid, those with extragenital primary sores, and those with no recognizable primary sores, our early diagnosis is so reduced that one should be quite safe in estimating that not more than about 40 percent of syphilitic infections are diagnosed in the seronegative primary period.

But, if we consult the annual rates for syphilis and for chancroid since 1917, we see some very hopeful trends. Syphilis is apparently on the increase (nearly threefold since 1917) and chancroid apparently on the decrease (30 percent since 1930), and 1932 was the first year in which the syphilis rate was reported higher than the chancroid rate. What does all this mean? Simply better diagnosis—absolutely nothing else. There is no reason to suppose that the syphilis rate at large is undergoing any appreciable change in the

same country from year to year or that it will change until some very radical change in our social structure and medical practice brings about an enormous increase in the amount of treatment made easily available or obligatory for persons with early syphilis. Such abrupt drops in the rate, for example, have been repeatedly observed in heavily infected and previously untreated yaws regions where great quantities of arsenicals and heavy metals have been rather suddenly poured into the populations.

In connection with Navy rates, this writer has often heard both line and medical officers commenting with pride, even boastfully at times, on the especially low rates for syphilis on their particular ships or stations. Such statements are simply admissions of indifferent surveillance and very weak diagnosis, and if we can point with pride to anything on any ship or station it is a high syphilis rate.

The Navy rates (new infections per thousand men) since 1917 are as follows:

	Syphilis	Chan- croid		Syphilis	Chan- croid
1917.....	10.05	21	1925.....	19.60	27
1918.....	11.83	15	1926.....	22.02	25
1919.....	16.45	26	1927.....	24.57	36
1920.....	17.54	29	1928.....	22.69	29
1921.....	17.84	24	1929.....	21.64	31
1922.....	20.03	25	1930.....	25.03	35
1923.....	18.62	26	1931.....	25.46	33
1924.....	19.74	32	1932.....	27.66	24

Note that in 1932 the chancroid rate was for the first time reported lower than the syphilis rate.

Few persons outside of those extensively and intimately engaged in syphilis work appreciate the full importance of diagnosis in the seronegative primary period and the immediate institution of treatment. The result of the dark field should be awaited with the same interest as the white count in a suspected acute appendix and the first arsenical given with no more delay than the appendectomy. One should never wait (as is unfortunately often the case) until the next routine weekly treatment day, which may be as much as 6 days later than the date of diagnosis. The probability of cure (biological, serological, and symptomatic) should be (assuming adequate treatment) 95 to 100 percent in the cases where treatment is started in the seronegative period, as against 85 to 90 percent in those started in the seropositive primary or early secondary period.

Arsphenamine is of such definite superiority in the treatment of early syphilis that there should be no excuse for not using it as the routine arsenical in early cases at the hospitals and large shore stations. On the ships, especially the smaller ones, it might reason-

ably be objected to because of lack of space for its preparation and administration and also because of difficulties in using it while the ships are under way. Healing of early surface lesions is accomplished with about half the number of injections with arsphenamine as compared to the other arsenicals, and in the early seropositive cases serological reversal is produced in about three-fourths the time. Arsphenamine has other advantages, such as greater chemical stability (with a consequent smaller risk of reactions), but these need not be discussed here. Of the 131,486 injections of trivalent arsenicals given in 1932, only 174 were of arsphenamine. Following the extensive literature on the relative merits of the various arsenicals in the past 2 years it is expected that the wide use of arsphenamine will be revived in the Navy. It is the routine drug for early syphilis at the San Diego hospital, where some 4,000 injections of it per year are now being used.

It is a matter of great satisfaction to note the rapidly increasing use of antisyphilitic arsenicals in the Navy during the past 8 years, and analysis of the figures brings out some very interesting points. In the table below, the number of injections of the various arsphenamines (arsphenamine, neoarsphenamine, sulpharsphenamine, silver arsphenamine) are lumped together for the sake of graphic convenience for each year since 1925.

	Trivalent arsenicals	Trypar- samide		Triva- lent ar- senicals	Trypar- samide
1925.....	47,717	1,160	1929.....	83,051	2,383
1926.....	63,163	1,232	1930.....	88,460	4,418
1927.....	74,478	2,054	1931.....	97,984	5,929
1928.....	81,000	2,551	1932.....	131,486	6,783

At first glance, the 131,486 injections given in 1932 appears a handsome quantity, but on further examination, as nearly as can be calculated from available data, it falls quite definitely short of what is considered today an adequate amount. These injections were given to 20,644 persons, of whom 13,842 were syphilitics of the Navy and Marine Corps. It is not stated what portion of the 131,486 injections was received by active service personnel, but if we assume an even distribution, their share was about 88,000 injections. In any large syphilis clinic as on any large ship or shore station about one-half the injections given are for persons who are in the first year of the infection. On such a basis, the 3,000 new cases during the year received 44,000 injections. The very minimum during the first year of treatment should be 20 injections, so that these 3,000 new syphilitics should have received 60,000 injections. Of course, these calculations may be based on very faulty assumptions

as to the distribution of the 131,486 injections, but if the early syphilitics really received a larger share than these calculations indicate, then the other groups must have received a correspondingly insufficient amount below that shown for them by these figures.

It will be noted that the use of tryparsamide has increased greatly since 1925 when it first came into wide use in the Navy. Much of the increase shown in the table was doubtless due to the increasing numbers of neurosyphilitic veterans admitted to naval hospitals during the period 1925 to 1932. But some of the increase, it is believed (and hoped) was due to an increasing practice of routine spinal fluid examinations and an increasing appreciation of the frequency and importance of central nervous system involvement. Numerous instances of misuse of the drug have been noted during the examination of health records. This misuse is most frequently noted in cases of early meningovascular syphilis, where very little of the trivalent arsenicals and the heavy metals had been used. In such cases, the trivalent arsenicals and the heavy metals in more intensified and prolonged courses than ordinary is the only procedure of value.

While we cannot escape the fact of the inadequacy of the amount of treatment used by the Navy, the progressive increase in recent years certainly indicates a rapid approach toward an ideal treatment program, and in this connection, lest some reader believe that the Navy treatment is being represented here in any unfavorable comparison with that received by any other large group of syphilitics, it may be said at once that this writer, after rather wide observations as to the treatment received by syphilitics outside the Navy, has long held that Navy syphilis is treated as well as, probably better than, syphilis in any other institution in the world. The reason for this is obvious—cooperation obligatory; and no expense to the patient.

The superiority of continuous as compared to intermittent treatment was first recorded in a publication by Almkvist (1) in 1920, although the fact of this superiority was established by Keidel (2) in 1916 at the Johns Hopkins syphilis clinic where the system of continuous treatment has since been in use. By plotting a curve of the course of serological changes and tendencies to relapse in a large group of cases on intermittent treatment, Keidel showed that the line was an undulating one, the crests (more strongly positive serology and greater tendency to relapse) coinciding with the rest periods and the depressions with the treatment periods. The curve for a large group on continuous treatment is at first a horizontal, then a gradually drooping line.

Several of the leading syphilis clinics of this country in association with the United States Public Health Service have recently formed a cooperative clinical group and have jointly conducted an



exhaustive analysis of their combined records with reference particularly to questions of treatment and prognosis. This group has shown that in early syphilis the chances of good clinical results are about three-fourths as strong with intermittent, and about one-half as strong with irregular, as with continuous treatment. As to serological reversal, the chances bear about these same ratios under the three forms of treatment. Early syphilitics treated by the three methods should become Kahn fast in about the following percentages of cases: Continuous, 11 percent; intermittent, 37 percent; irregular, 68 percent. In any large group of early syphilitics the incidence expectancy of neurosyphilis is three times as great among those on irregular treatment as among those on continuous treatment.

This writer has for several years had occasion to examine rather closely a few hundred syphilitic abstract sheets a year. Only exceptionally was there any indication that a program of continuous treatment had been followed. Certain other faults in the management of cases recurred so commonly that these will be dealt with later in a summarized form.

At this point, lest there be any doubt as to the meaning of "continuous treatment", this is best described by the statement "no rest periods." The intervals between courses of arsenicals are simply filled in by weekly injections of bismuth. The following tabulated program of continuous treatment for the first year fulfills all the modern ideas of adequacy and has been found very convenient to remember, both for patient and doctor, and quite simple to record. It consists simply of courses of 10 injections of an arsphenamine alternating with courses of 10 injections of bismuth. Note the "overlapping" in the first course, so that not more than 5 weeks will elapse between the first and second courses of arsenicals.

*Week*

- 1..... Arsphenamine 0.3 (or neo 0.3 g).
- 2..... Arsphenamine 0.4 (or neo 0.6 g).
- 3..... Arsphenamine 0.4 (or neo 0.6 g).
- 4..... Arsphenamine 0.4 (or neo 0.6 g).
- 5..... Arsphenamine 0.4 (or neo 0.6 g).
- 6..... Arsphenamine 0.4 (or neo 0.6 g)—Bismuth salicylate 0.1 g.
- 7..... Arsphenamine 0.4 (or neo 0.6 g)—Bismuth salicylate 0.1 g.
- 8..... Arsphenamine 0.4 (or neo 0.6 g)—Bismuth salicylate 0.1 g.
- 9..... Arsphenamine 0.4 (or neo 0.6 g)—Bismuth salicylate 0.1 g.
- 10..... Arsphenamine 0.5 (or neo 0.6 g)—Bismuth salicylate 0.1 g.
- 11..... Bismuth salicylate 0.1 g.
- 12..... Bismuth salicylate 0.1 g.
- 13..... Bismuth salicylate 0.1 g.
- 14..... Bismuth salicylate 0.1 g.
- 15..... Bismuth salicylate 0.1 g.
- 16..... Arsphenamine 0.3 (or neo 0.3 g).
- 17..... Arsphenamine 0.4 (or neo 0.6 g).

*Week*

18.....	Arsphenamine 0.4 (or neo 0.6 g).
19.....	Arsphenamine 0.4 (or neo 0.6 g).
20.....	Arsphenamine 0.4 (or neo 0.6 g).
21.....	Arsphenamine 0.4 (or neo 0.6 g).
22.....	Arsphenamine 0.4 (or neo 0.6 g).
23.....	Arsphenamine 0.4 (or neo 0.6 g).
24.....	Arsphenamine 0.4 (or neo 0.6 g).
25.....	Arsphenamine 0.5 (or neo 0.6 g).
26.....	Bismuth salicylate 0.1 g.
27.....	Bismuth salicylate 0.1 g.
28.....	Bismuth salicylate 0.1 g.
29.....	Bismuth salicylate 0.1 g.
30.....	Bismuth salicylate 0.1 g.
31.....	Bismuth salicylate 0.1 g.
32.....	Bismuth salicylate 0.1 g.
33.....	Bismuth salicylate 0.1 g.
34.....	Bismuth salicylate 0.1 g.
35.....	Bismuth salicylate 0.1 g.
36.....	Arsphenamine 0.3 (or neo 0.3 g).
37.....	Arsphenamine 0.4 (or neo 0.6 g).
38.....	Arsphenamine 0.4 (or neo 0.6 g).
39.....	Arsphenamine 0.4 (or neo 0.6 g).
40.....	Arsphenamine 0.4 (or neo 0.6 g).
41.....	Arsphenamine 0.4 (or neo 0.6 g).
42.....	Arsphenamine 0.4 (or neo 0.6 g).
43.....	Arsphenamine 0.4 (or neo 0.6 g).
44.....	Arsphenamine 0.4 (or neo 0.6 g).
45.....	Arsphenamine 0.5 (or neo 0.6 g).
46.....	Bismuth salicylate 0.1 g.
47.....	Bismuth salicylate 0.1 g.
48.....	Bismuth salicylate 0.1 g.
49.....	Bismuth salicylate 0.1 g.
50.....	Bismuth salicylate 0.1 g.
51.....	Bismuth salicylate 0.1 g.
52.....	Bismuth salicylate 0.1 g.
53.....	Bismuth salicylate 0.1 g.
54.....	Bismuth salicylate 0.1 g.
55.....	Bismuth salicylate 0.1 g.

During the second year the arsphenamine courses may be shortened and the bismuth courses lengthened, e.g., 6 to 8 arsphenamines between courses of 10 to 15 of bismuth. The treatment (except in cases of real intolerance of arsenicals) is unremitting and must not cease until the Kahn has remained negative for a year and there has been no evidence of relapse for a year.

Some medical officers are loath to give treatment in the latent cases, reasoning that the risk from the disease in such cases is less than that from the treatment. The risk of death from treatment is generally stated at about 3 per 1,000 patients, but this is higher than the Navy experience of less than 1 per thousand. But, if we compare the risk from treatment (about 0.03 to 0.3 percent) to the risk

from absence of treatment, all doubt as to the advisability of treatment, even in the latent class (where the prognosis in the absence of treatment is the best of all classes of untreated syphilis), should be removed. The outcome in untreated latent cases is expected to be about as follows:

	<i>Percent</i>
Spontaneous "cure"-----	25-35
Remain latent-----	25-35
Develop late skin and bone involvement-----	10-15
Develop cardiocascular lesions-----	10-15
Develop clinical neurosyphilis-----	1- 2

In setting down the following table of rules, an attempt has been made to list them in their order of importance, importance being considered in the clinical sense and from the standpoint of relative frequency of the different defects in the management of cases as judged from the reading of many hundreds of syphilitic health records, only 3 or 4 in a hundred of which show what could be considered today as ideal handling.

1. In the case of any genital sore, any sore on the lips, or a sore elsewhere that bears any resemblance to a chancre in appearance and fails to heal promptly, the suspicion of syphilis must not be discarded until unconfirmed by at least 3 months of systematic investigation.

2. In suspected sores, a dark field should be done three times a week until a diagnosis of syphilis is made or the sore heals.

3. Beginning 2 weeks after the appearance of the sore, the Kahn should be repeated every week for 10 weeks unless it becomes positive or a diagnosis is made earlier by other means.

4. Even if a diagnosis is made without serological tests, the blood should be taken for serological test before treatment starts, since the decision as to the duration of treatment will depend somewhat on the pretreatment serology. The Kahn should be repeated every 3 months during the first year and every 6 months thereafter, since treatment decisions and knowledge of the course of the disease may have to be based largely on these records of serology.

5. Beginning 3 weeks after the appearance of the sore, the skin and pharynx and the lymph-gland groups (inguinal, cervical, epitrochlear, especially) should be observed at frequent intervals (once a week the first month, then once a month during the first year), at first for diagnostic purposes and later as a systematic check-up on the course of the disease.

6. No antisypilitic treatment should ever, under any circumstances be given in suspected early cases until the diagnosis has been made. Such treatment seriously delays and confuses the diagnosis. No local antiseptics should be used on suspected primary sores. Such treatment is apt to destroy the dark field and is of no help in healing.

7. A small amount of early treatment, if followed by a long rest period (more properly called a "neglect" period) will do much more harm than good. The worst types of relapse are often seen in such cases. More immunity than treponemes is destroyed by such a treatment program.

8. Arsenical reactions should rarely justify discontinuation of treatment. Forms of reaction which constitute contraindication for further arsenicals are limited essentially to the exfoliative types of dermatitis and the blood dyscrasias.

9. Mercury has scarcely a place in antisymphilitic therapy today because of the well established superiority of bismuth. The iodides also, are used only exceptionally; usually in cases where the other drugs are not tolerated.

10. Spinal fluid examination should be routine at the end of the first year. It should also be routine in all Kahn fast cases, since it often reveals the explanation for the fastness.

11. Late skin and bone lesions call for at least four courses each of arsphenamine (or neoarsphenamine) and bismuth after the appearance of the lesions. Relapse in these cases is 6 times as probable if only 1 course is given as when 4 courses are given.

12. Keep detailed records of every event in the course of the disease and the course of treatment. Instead of making a scratch in the abstract sheet at the time of each injection, keep treatment records in a separate book and transcribe to abstract with typewriter at end of each course. This greatly facilitates the planning of further treatment when the patient is transferred to a new command.

13. Men under active treatment should never be deprived of treatment because of service conditions. In the base force there is an excellent regulation which prohibits transfer of such men to ships other than those carrying a medical officer. It is as much the medical officer's duty to see to it that the patient gets the injection as it is to give the injection. If men are absent (on working parties, etc.) at the routine hour of treatment, they must be found later the same or next day and given the injection, no matter how inconvenient this may be either to the patient or the medical department. Men cannot be expected to appreciate the importance of a "never-skip" program of treatment. This is purely the doctor's responsibility.

#### SUMMARY

1. The apparent increase in syphilis and apparent decline of chancroid in the Navy is accounted for by better diagnosis (with still much room for improvement).

2. Antisyphilitic treatment in the Navy, while showing a fine approach toward the ideal, is still far from adequate.

3. Health records almost always show defects in the understanding of modern principles of the diagnosis and treatment of syphilis. With these defects in mind, a summarized form of rules has been set down.

#### BIBLIOGRAPHY

- (1) Almkvist, J. Continuous treatment of syphilis instead of intermittent treatment, *Acta Derm—Ven* 1: 27, 1920.
- (2) Moore, J. E., and Keidel, A. The treatment of early syphilis. *Bull, J. H. Hosp.* 39: 1, 1926.

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#### INCIDENCE OF YAWS AND SYPHILIS IN FIVE RURAL VILLAGES, REPUBLIC OF PANAMA<sup>1</sup>

By PAUL W. WILSON, Lieutenant Commander, Medical Corps, United States Navy

[From the Gorgas Memorial Laboratory, Panama, R. de P.]

This paper is a report of a study of the incidence of yaws and syphilis among the inhabitants of five small towns situated near the junction of the Chagres and Gatuncillo Rivers and about 30 miles by boat and automobile from Panama City. These villages were chosen for survey as being typical rural communities where yaws has been endemic but located near enough to a large city to permit exposure to syphilis. During the course of the survey certain features were presented which merit consideration and they will be discussed. A total of 371 Negro adults and children above 5 years of age were studied. The total population of the five towns is approximately 720.

A history of previous yaws or syphilis infection together with history of the amount of treatment received was recorded for each person. It is considered that a positive history of yaws is usually accurate. A negative history may be given where the primary lesion is insignificant or where the infection occurred so early in childhood that the individual cannot remember and the parents are not at hand to give definite information. A history of syphilis, especially among Negroes, is of most uncertain value.

For the purpose of this survey only those cases have been listed as "probably syphilis" who have given a history of primary lesion on the genitals, two cases of congenital syphilis, one woman whose history was clearly typical, and a girl of 17 who admitted promiscuous intercourse during the past 4 years and who denied having had yaws. The physical examination was directed particularly toward revealing late lesions of syphilis or yaws in the eyes, mouth, throat, teeth, epitrochlear glands, skin, bones, and patellar reflexes. The heart was examined in all those cases with histories

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<sup>1</sup> Read before the three hundred twenty-ninth meeting of the Medical Association of the Isthmian Canal Zone, held at Gorgas Memorial Laboratory, Apr. 17, 1934.

of yaws or syphilis and all those whose blood revealed a positive serology. All the cases studied have been classified under the same clinico-serological headings as those employed originally by the Jamaica Yaws Commission in their report for 1932 (1).

Table 1 shows the summary of the findings in the different villages. Under the heading of "Yaws" are counted all those with a past history of yaws as well as those who now have evident yaws lesions. Only a few cases of yaws in the early secondary period were observed. The heading of "No history—Positive serology" is self-explanatory. A three-plus reaction in either Wassermann or Kahn test alone has been considered sufficient to list a serology as positive for the purposes of this classification. The heading of "No history—Equivocal serology" needs no explanation. In these cases one of the tests is negative while the other would show one- or two-plus. All cases showing negative Wassermann and a plus-minus reaction by Kahn test are listed as of negative serology.

TABLE I.—*Yaws—Syphilis survey of 5 Chagres River villages*

Villages	Yaws		Probably syphilis		No history—positive serology		No history—equivocal serology		No history—negative serology		Total number examined
	Cases	Per-cent	Cases	Per-cent	Cases	Per-cent	Cases	Per-cent	Cases	Per-cent	
Santa Rosa.....	20	17.3	7	6.0	8	6.9	9	7.8	71	60.8	115
Guayabalito.....	7	8.4	3	3.6	6	7.2	4	4.8	62	74.6	82
Las Guacas.....	3	11.1	2	7.4	1	3.7	0		21	77.7	27
Gatuncillo.....	10	26.3	0		3	7.9	2	5.2	23	60.5	38
Nuevo San Juan.....	21	19.0	8	7.2	2	1.8	6	5.4	73	66.3	110
Total.....	61	16.4	20	5.3	20	5.3	21	5.8	250	67.2	372

Actual number examined, 371.

It will be seen from the table that the yaws incidence varies considerably in the five towns—from 8.4 percent to 26.3 percent. Guayabalito (8.4 percent) and Santa Rosa (17.3 percent) are so close together that one steps from one town into the other with less than a hundred yards between the nearest houses. In Santa Rosa the houses are very close together on two sides of a narrow street, while in Guayabalito they are scattered in a haphazard pattern and widely separated from each other along the river bank. Such a spotty distribution of yaws is quite common. Both in Darien and in Haiti it was not unusual to find neighborhoods entirely free from yaws and completely surrounded by other groups of families with a yaws incidence of 60 percent or more. These observations are of interest in bearing out the belief that yaws is principally spread by contact or some mechanical transference of infectious material which is effective only at close range.

The highest yaws incidence, that of 26.3 percent, in Gatuncillo considered together with the absence of syphilis in the same town is of interest. Certainly this group is not large enough to give us

reliable information but these findings fit in with the usual relative prevalence of the two diseases in the same locality. Where there is a high yaws incidence the syphilis index is always very low or negligible. For example, in Haiti syphilis is practically unknown in rural districts; also in the Kenya Colony in Africa where yaws and syphilis clinics have been conducted for a number of years the same observations have been made (2). In the recent Jamaica survey of 1,500 clinic cases (1) the yaws incidence was 61.1 percent and the incidence of "probable syphilis" was 1 percent.

The discrepancy between 372, total number examined which appears on the table, and 371, the actual number examined, is explained by the fact that one man gave typical history of having had both yaws and syphilis. This man was 37 years old, and stated that he had yaws in 1902, and that the mother yaw was on the dorsum of the right foot. A scar on the site of the mother yaw is now present. He stated that in 1912, 10 years later, he contracted gonorrhea, and that a week or two later he had a sore on the penis which was not painful and which healed in 4 to 6 weeks. He received no specific treatment for either infection. His son, a boy 10 years old, has never had yaws, but he now has a three-plus Wassermann, two-plus Kahn, bilateral epitrochlear adenopathy and typical Hutchinson's teeth. Such cases of syphilis infection superimposed under natural conditions on an old untreated yaws infection are extremely rare. The writer has seen but one other case similar to this in a Haitian. In neither of the two cases were both infections actually seen in the same individual; history and what appeared to be old yaws scars were the only evidence obtainable of the earlier yaws infection.

TABLE II.—*Wassermann and Kahn test readings in 46 untreated cases of yaws*

Case no.	W	K	Time elapsed since infection	Case no.	W	K	Time elapsed since infection
			Years				Years
344.....	—	—	60	227.....	—	—	20
286.....	+	++	51	332.....	+	+++	18
300.....	—	+	50	272.....	—	+++	18
255.....	++++	+	50	152.....	+++	++	14
200.....	—	++	44	275.....	—	+	14
371.....	++++	++	40	5.....	+	++	13
54.....	++++	++++	40	23.....	+++	+++	12
107.....	—	++++	40	260.....	++++	+++	12
209.....	—	—	39	280.....	—	++	12
134.....	—	+++	38	287.....	—	+++	12
237.....	++++	++	38	78.....	+++	++++	10
239.....	++++	+	38	56.....	+	+	9
146.....	—	—	36	193.....	—	—	9
312.....	—	—	36	317.....	++++	++++	9
80.....	—	±	34	40.....	++++	++++	7
10.....	—	—	34	21.....	++++	+++	6
278.....	—	—	33	296.....	++++	+++	6
29.....	++++	+++	30	243.....	++++	+	5
141.....	+	++++	28	184.....	+	—	3
91.....	++++	++++	26	242.....	++++	+	1 2
325.....	—	—	22	258.....	++++	++	1 6
282.....	—	+++	18	284.....	++++	+++	1 3-4
259.....	—	+++	22	342.....	++++	++++	(?)

1 Months.

In table II among the 46 unrelated cases of yaws it is interesting to note that 19 of the 33 cases whose yaws infection occurred more than 10 years earlier revealed a negative Wassermann reaction; 8 cases were negative by both Kahn and Wassermann tests, and 11 gave negative Wassermann with varying degrees of positive Kahn reactions. It should be explained that all the serological work for this survey was done by the board of health laboratory, Ancon, and that their reports for Wassermann reactions are made only on a two-plus basis. For the purpose of this report it was thought best to convert these readings to a four-plus basis for easier comparison with the Kahn. Therefore, a laboratory report of two-plus Wassermann is transcribed here as four-plus, a one-plus is shown as three-plus, and a plus-minus reaction as a one-plus. This table is probably a fair demonstration of the relative delicacy of the two tests. Attention is called to case no. 342, who is a man 66 years old and has juxta-articular nodes on both elbows; he denies both yaws and syphilis, and is placed arbitrarily in the yaws group.

TABLE III.—Wassermann and Kahn test readings in 15 treated cases of yaws

Case no.	W	K	Time elapsed since infection	Treatment	Case no.	W	K	Time elapsed since infection	Treatment
			Years					Years	
106.....	—	—	38	6 neo.	27.....	—	++	10	3 neo.
292.....	+++	++++	30	2 neo.	215.....	—	—	6	50-100 Carbar-sone.
12.....	—	—	25	12 neo.					
337.....	—	—	20	3 neo.	369.....	—	—	6	3 neo.
167.....	—	±	16	9 neo.	150.....	—	±	4	6 neo.
152.....	+++	++	14	1 neo.	2.....	++++	+++	3	Carbar-sone.
53.....	—	±	12	16 neo.	322.....	—	—	1	13 noe.
24.....	—	++	10	3 neo.					
52.....	—	++	10	4 neo.					

Table III needs no explanation. It is now generally accepted that yaws cases require considerable more treatment than was originally given when salvarsan was first employed. The Jamaica Yaws Commission recommend in their 1932 report that the treatment consist of neoarsphenamine alone or alternating with bismuth in a total approximating six doses (1).

TABLE IV.—Wassermann and Kahn test readings in 9 cases of untreated syphilis

Case no.	W	K	Time elapsed since infection	
			Years	
218.....	++++	+++	24	Father of boy who has congenital syphilis.
46.....	++++	++++	22	
191.....	++++	+++	19	
1.....	—	+++	19	Tabes dorsalis, Charcot knee.
173.....	+++	++++	16	
350.....	++++	+++	14	Boy 14 years old. Hutchinson's teeth.
47.....	+++	++	10	Boy 10 years old. Hutchinson's teeth.
299.....	—	+++	3	
36.....	++++	+++	1	



TABLE V.—*Wassermann and Kahn test readings in 11 cases of treated syphilis*

Case no.	W	K	Time elapsed since infection	Treatment
			Years	
39.....	—	—	20	4 neosalvarsans.
44.....	—	—	18	6-8 neosalvarsans.
165.....	—	++	14	2 neosalvarsans.
310.....	—	—	12	3 neosalvarsans.
335.....	—	—	6	8 neosalvarsans.
283.....	+++	++	6	2 neosalvarsans.
293.....	++++	++++	5	3 neosalvarsans with 12 bismuth or mercury.
38.....	—	±	5	12 neosalvarsans.
169.....	++++	++	4	2 neosalvarsans.
28.....	++++	++++	3	3 neosalvarsans with 1 bismuth or mercury.
345.....	+	++++	2	4 neosalvarsans with (?) amount carbarsone.

Among the 9 untreated cases of syphilis shown in table IV there are found 2 cases of congenital syphilis and 1 case of tabes with Charcot knee. The 11 treated cases of table V are interesting in that they showed no positive evidence of late pathology, and this in spite of the fact of such inadequate treatment.

TABLE VI.—*Wassermann and Kahn test readings in 20 cases with negative history and positive serology*

Case no.	Sex	Age	W	K	Case no.	Sex	Age	W	K
6.....	M	15	—	+++	18.....	F	24	++++	+++
8.....	M	29	—	+++	68.....	F	36	++++	++++
109.....	M	41	++++	++++	96.....	F	17	++++	++++
148.....	M	21	++++	+++	101.....	F	46	+	+++
170.....	M	18	++++	+++	104.....	F	21	++++	+++
175.....	M	20	—	+++	129.....	F	47	++++	+++
236.....	M	44	++++	++	139 <sup>1</sup> .....	F	66	+++	++++
343.....	M	21	+	++	168.....	F	26	—	+++
225.....	M	31	+++	+	246.....	F	23	++++	++
213.....	M	21	++++	+++	306.....	F	17	++++	++++

<sup>1</sup> Aortitis.

Of those enumerated in table VI it is quite probable that most of the female cases are of syphilitic origin—history of primary lesion being usually unobtainable from women.

One of these women, case no. 139, revealed a definite aortitis with blowing diastolic murmur, increased area of supracardiac dullness (9.3 cm by X-ray), and symptoms of cardiac decompensation during the last 3 years. She states that 28 years ago she had "rheumatism" for several months. During the rheumatic attack both knees and both ankles were swollen, she was able to do most of her work during the entire period, was never confined to bed on account of her "rheumatism" and does not recall that she had any fever during the attack. Two or three years later she had what is called by the natives of the country districts "Calor de higado" or "liver heat" of the sole of the right foot and the palms of both hands which lasted for more than a year. This "Calor de higado" is a psoriasis-

like dermatitis of the palms and soles and is a frequent late finding in yaws. ("Clavo" or "Clavos" meaning corn or callous, is also used for the same condition.) It is also found in syphilis. She has 12 children and had one abortion after the youngest child was born. She was born and raised in San Juan de Pequeni where yaws was prevalent, but she states that she does not remember ever having had yaws. History of syphilis is also negative. Her rheumatism could be of either yaws or syphilis etiology. On account of the present aortitis many pathologists would definitely place this woman in the syphilis group. The writer feels that there is insufficient evidence to place her definitely in either group.

TABLE VII.—*Wassermann and Kahn test readings in 21 cases with negative history and equivocal serology*

Case no.	Sex	Age	W	K	Case no.	Sex	Age	W	K
7.....	F	35	—	+	264.....	F	20	—	+
9.....	F	14	—	+	282.....	F	12	—	+
17.....	F	30	—	++	305.....	F	27	—	+
79.....	F	53	—	++	314.....	F	13	+++	—
92.....	F	64	—	++	314.....			+	—
93.....	M	46	—	++	314.....			—	—
94.....	F	7	—	+	357.....	M	61	—	++
103.....	F	29	—	+	357.....			—	—
135.....	F	42	—	++	42.....	M	21	+	+
137.....	F	29	—	++	42.....			—	+
162.....	M	21	—	++	308.....	F	47	+++	—
178.....	F	59	—	+++	308.....			+	—
233.....	F	51	—	++	308.....			?	—
244.....	F	25	—	+					

SUMMARY OF WASSERMANN AND KAHN TEST READINGS IN 121 CASES

	Cases
Negative Wassermann and Kahn (yaws and syphilis groups only).....	26
Strongly positive Wassermann and Kahn (3+ or 4+).....	32
Weakly positive Wassermann and Kahn (1+ or 2+).....	4
Strongly positive Wassermann and weakly positive Kahn.....	12
Weakly positive Wassermann and strongly positive Kahn.....	4
Negative Wassermann and positive Kahn.....	10
Negative Wassermann and weakly positive Kahn.....	31
Strongly positive Wassermann and negative Kahn.....	0
Weakly positive Wassermann and negative Kahn.....	2
	121

Table VII will not be discussed in detail. Just what proportion of these have a background of yaws or syphilis is impossible to estimate. It is quite likely that with repeated checks of both Kahn and Wassermann tests, a fair number in this group would react somewhat as the last four cases listed. In case no. 314 the Wassermann was three-plus, a week later two-plus, and finally negative after the second week, with the Kahn constantly negative. In case no. 42 a Wassermann one-plus changed to negative. In case no. 308 there is a constant Kahn negative with Wassermann three-plus,

later two-plus, and finally anticomplementary. The summary of the Wassermann and Kahn test readings needs no explanation, and it is not the desire to enter into any discussion concerning the relative merits of the two tests. But it would appear that the two tests taken together would give more accurate information than either one alone.

TABLE VIII.—*Bilateral epitrochlear adenopathy*

Age group	Yaws			Probably syphilis			No history—positive serology		
	Number of cases	Bilateral adenopathy	Per cent	Number of cases	Bilateral adenopathy	Per cent	Number of cases	Bilateral adenopathy	Per cent
5-10 years.....	0			0			0		
10-15 years.....	7	3	42.9	2	2	100	0		
15-20 years.....	9	5	55.5	0			5	1	20.0
20 years and over.....	45	12	26.3	18	10	55.5	15	6	40.0
Total.....	61	20	32.7	20	12	60.0	20	7	35.0

Age group	No history—equivocal serology			No history—negative serology			Total examined
	Number of cases	Bilateral adenopathy	Per cent	Number of cases	Bilateral adenopathy	Per cent	
5-10 years.....	1	0	0	32	11	34.3	33
10-15 years.....	3	0	0	52	16	30.3	64
15-20 years.....	1	0	0	44	11	25.0	59
20 years and over.....	16	3	18.7	121	18	14.8	215
Total.....	21	3	14.3	249	56	22.1	371

In table VIII is a tabulation of the incidence of bilateral epitrochlear adenopathy, further subdivided to show also the incidence for the different age groups. It is considered that the number examined is too small, especially in the syphilis group, to give even an approximate estimate of the actual incidence, but it is believed that the number is sufficient to show the trend. In those cases listed under "No history—Negative serology" the diminishing incidence with advancing age is clearly demonstrated. In considering the 20 cases of "probable syphilis" the higher incidence (60 percent) in this group as compared with the others is shown, but to put it in another way, nearly half of the entire group did not show it. In the 9 untreated cases of syphilis 5 cases did not show epitrochlear adenopathy.

In addition to the tables here shown there are some other findings which are worthy of mention. Juxta-articular nodes were found in six cases, or 10 percent of the yaws cases in the group under consideration. In Darien these nodes were found in 4.4 percent of 424 cases of yaws (3) while in the Haitian group of 1,423 consecutive

cases only 6 cases were found, or 0.42 percent. In view of the very marked difference in the virulence of Haitian yaws as compared with that found in Panama thus far, and reported in an earlier paper (3), may it not be true that the incidence of juxta-articular nodes is a rough expression of the relative virulence of that particular strain of treponema for the locality concerned, and that the higher the incidence of these nodes the milder the virulence of the treponema causing them? All six of the cases here cited gave strongly positive serology. Two of the cases were children of 12 and 13 years with history of yaws the year before. There were 3 cases in adults whose yaws infections dated 30, 40, and 50 years earlier, and 1 case in a man 64 years old who denied both yaws and syphilis. Usually these tumors are bilateral but this feature is not constant.

They are usually seen only in adults but the writer has now seen three cases in Panaman children. A third case in Darien Province was that of a child 7 years old. Hermans, in his monograph on yaws, published in 1931 (4) points out that "it is remarkable that syphilis too, in a tropical and subtropical climate, seems to cause the same sort of lesion (juxta-articular node)." A few such lesions of syphilitic origin have been also reported from the Temperate Zone. He gives it as his opinion that "the nodosities may develop in the fasciæ at places which are continually subject to the pressure of the underlying tissues during sleep. Such places form a *locus minoris resistentiæ* for the spirochæte." One of the cases seen in Gatuncillo presented juxta-articular nodes only on the left side—on the left elbow, and over the external tuberosities of the left fibula at the knee and ankle. This man states that for as long as he can remember he has always slept reclining on his left side. This case would tend to corroborate the theory advanced by Hermans.

There is one other type of case which merits being reported more in detail. Case no. 300 is that of a man 64 years old who had yaws when he was 10 years old. Between 10 and 20 years ago, as nearly as he can remember, or between the ages of 44 and 54, he had a stroke of facial paralysis which is persistent to this date. He denies venereal disease. The Wassermann reaction was negative on two occasions. The Kahn test was reported one-plus on the first test and two-plus a week later. The age at which this cerebral accident occurred is in the border line period between arteritis and arteriosclerosis; and autopsy is the only means whereby diagnosis may finally be established.

Inquiry was also made of all women over 14 years of age as to history of abortions. Of the 10 women in the "Negative history, with positive serology" group, 3 gave a history of abortion. Of the 95 women in the "Negative history, with negative serology"

group there were 30 who gave a history of abortions. The number of women in both groups is too low to be of real value, but the findings correspond with what has been reported to the writer by several observers of long residence here, namely, that abortions are not appreciably more common among women of the Negro race in this locality with a positive serology than it is among those with a negative serology.

Though not a part of the survey which has been reported in this paper, it is of interest in this connection to report here briefly some findings of the yaws clinic conducted in Darien for 15 months, ending last October. From that clinic blood sera were sent in to the Public Health laboratory for analysis in selected cases for whom it was desired to obtain additional evidence, especially in patients presenting unusual lesions of early or late yaws and in another group who came to the clinic for other conditions and who showed no evidence of yaws pathology but who gave a history of yaws infection more than 10 years earlier. (Only one history of probable primary syphilis was obtained in the Darien clinic, and that patient brought his lesion from Colombia.) The sera of 85 Darien patients were examined, of which 61 gave positive, 8 equivocal, and 20 negative reactions. Or 71 percent were positive.

The Darien clinic only served about one-third of the Province, and in the region served it is estimated there was a total population of about 2,500. A total of 447 cases of yaws were treated, or an estimated incidence of clinical cases of 18 percent. But it must be borne in mind that this incidence figure cannot be compared with the incidence of 16.4 percent obtained for the Chagres River group, for in Darien only those cases were listed which came to the clinic with active yaws pathology and to whom treatment was given. If those apparently well but with positive history could be added it is believed that the incidence figure would be more than doubled.

In conclusion, no further summary is required than that contained in the tables, but this opportunity is taken to discuss briefly certain phases of the yaws-syphilis problem. From casual observation it would seem that locally there has been a tendency on the part of both clinicians and pathologists to classify all positive serological reactions as of syphilitic origin. Such an attitude is probably justified for those cases who have been born and raised in the large centers of population. Certainly it is not justified for any cases who were born and have spent a portion of their childhood in the Chagres River region or Darien Province. It is quite probable that the same will apply for many other rural communities after more complete studies have been made.

It is the usual practice in the Tropics to relegate history-taking to the position of least importance in diagnostic procedure. Time is

saved and often the laboratory diagnosis is all that is indicated for a fair percentage of dispensary and hospital cases. It is believed that in order to arrive at more accurate morbidity statistics for yaws or syphilis history-taking must be given first importance. It has been the universal experience of all workers in the yaws clinic that all patients, or in the case of a child, the parents living in an endemic yaws area, almost invariably diagnose yaws correctly in the early periods, and even for lesions of late pathological manifestations they are usually more accurate than the attending physician unless he should be one who has had wide experience in this field. Usually the positive yaws history can be further substantiated by having the patient point out the scar left by the mother yaw.

In the physical examination of the late yaws cases that have originated in the regions studied in Panama the usual tertiary lesions seen are the atrophic and hypertrophic keratoses of the palms and soles, persistent ulcer over the site of the mother yaw, and juxta-articular nodes. Hermans has also noted ganglia of the tendon sheaths (4). One such case was seen in Nuevo San Juan. None of these findings should be considered pathognomonic and it must not be forgotten that most of the old cases of apparently healed yaws show nothing at all.

The ultimate solution of the yaws-syphilis controversy would seem to rest on whether it can be proved that yaws does or does not occasionally cause "syphilitic" arteritis. It is believed that only by more careful clinical and pathological study of long series of cases in different localities will this question finally be answered.

In this connection it is considered that the finding of arteritis in cases of the first or second decade of life with positive yaws history would be more convincing evidence supporting the identity theory of yaws and syphilis, but it is believed that the most convinced believer in the identity theory usually admits that the two types of treponema concerned are widely separated in virulence. For this reason it is anticipated that even with the yaws infection occurring one or two decades earlier than is usual with syphilis it is expected that any arterial pathology that may be discovered would be found in age groups even older than among the syphilitic group. Of course here the dualist would insist that syphilitic atheromatous changes in such cases would be due to syphilis superimposed on the previous yaws infection. But it must be remembered that evidence is constantly accumulating to the effect that untreated yaws cases do not contract syphilis under natural conditions, except in extremely rare instances. It is the writers opinion that very rarely yaws does attack the arteries, causing aortitis and cerebral thrombosis or cerebral hemorrhage.

I wish to take this opportunity to express my appreciation to Dr. L. B. Bates and the Board of Health Laboratory personnel, Ancon, for doing the serological work on all blood sera.

#### REFERENCES

- (1) Report of the Jamaica Yaws Commission for 1932.
- (2) Medical Department Annual Reports, Colony and Protectorate of Kenya.
- (3) Willson, Paul W., Amer. Jour. Trop. Med., Jan., 1934.
- (4) Hermans, E. H., "Framboesia Tropica", published by "Society of Tropical Medicine Laiden-Rotterdam.

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#### CHRISTOPHER COLUMBUS, AND THE AMERICAN ORIGIN OF SYPHILIS<sup>1</sup>

By R. C. HOLCOMB, Captain, Medical Corps, United States Navy (Retired)

Since the year of 1900 several books have appeared attributing the European origin of syphilis to an importation from America in the first voyage of Christopher Columbus. Among these works we note the book by Iwan Bloch, a large volume in German text, of more than 750 pages (*Der Ursprung der Syphilis*, Jena, 1901). This was followed by a paper giving the disease the name *Morbus Americanus*, and presented at the Stuttgart meeting of the Congress of Americanists, and still later appeared his chapters in a large English System of Syphilis, in which he gives the disease the same title.

The Commemoration Volume of the American Medical Association, celebrating the completion of the Panama Canal, contained a monograph by William Allen Pusey (1915), attributing the origin of the European infection of syphilis to an importation by Christopher Columbus. This monograph was later published by the American Medical Association as a separate volume. Another work recently published by the same author (1933) makes practically the same statement as to the American origin of the disease.

From France has recently issued a volume on the history of the disease by Edward Jeanselme (*Histoire de la Syphilis son Origine son Expansion, etc., par E. Jeanselme*, 1931). This volume likewise attributes the origin of syphilis to an importation by Columbus.

These works when carefully analyzed bring out little new relating to the matter which has not already been presented in the undigested Aphrodisiacus collection of Luisinus; the Nine Books on Venereal Disease, by Jean Astruc; and the remarkable paper by the Spaniard, Montejo, published in 1882.

The space at my disposal is too short to go into such subjects as:

(a) The European development of the art of printing, its consequent dissemination of knowledge, and its influence on the develop-

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<sup>1</sup> Read at a meeting of the section on medical history of the College of Physicians, Philadelphia, Pa., Mar. 12, 1934.

ment of vulgate literature, stimulating if not enriching the scientific language.

(b) The rise of the surgeon in the public esteem, if not in the councils of the schools, universities, and faculties.

(c) The expulsion of the Jews from Spain, casting upon the other countries of Europe in the 4 months following March 30, 1492, a distressed, homeless, and penniless people, many of them ill and dying, and numbering according to near-contemporary accounts from 160,000 to 400,000 individuals.

(d) The confused state of ancient dermatology, as set forth in the book of the academic Niccolo Leonicensus.

(e) The bulls of Popes Innocent VIII of 1490, and of Julian II of 1505, abolishing the leper asylums of the Order of St. Lazarus.

(f) The breakdown of leprosy into a number of disease entities; resulting from the recognition, management, and control of the disease slipping from church domination into other hands.

(g) A new conception of pests, pestilences, and contagion, which arose out of the so-called epidemic of syphilis.

(h) And finally the antiquity of every symptom now constituting the modern clinical manifestation of syphilis.

These and similar subjects can barely be touched on. I purpose to present to your attention and consideration only the superstition of the holy wood, its influence on the rise of the theory of the introduction of the disease by Christopher Columbus, and the inconsistent and anachronistic character of the so-called evidence.

#### THE SUPERSTITION OF THE HOLY WOOD, GUAIACUM

For more than a third of a century after the discovery of America there was no mention of Columbus in the texts in connection with the origin of syphilis. It followed the introduction of a remedy that held sway for nearly two centuries as a specific for the cure of *Morbus gallicus*, as syphilis was called. This was the holy wood, guaiacum. It came from a newly discovered land shrouded with mystery. Not until nearly a decade after its introduction do we detect the early signs of associating the disease with the first voyage of Columbus. The early introduction of guaiacum and its use in syphilis was associated with the superstition that certain diseases develop as a punishment for sin as frequently encountered in the Scriptures, and that Divine Providence mercifully provides the antidote or remedy for a disease so inflicted, at the place where the disease originates, or among the people who were thus afflicted. As this remedy was discovered in the newly found lands, it follows that here the disease surely originated. Such superstition encouraged by the venders of the wood, or those who profited from it, found support



among physicians, and among deluded patients. Numbers of books were written by physicians, philosophers, and laymen who lauded the marvelous properties of this holy wood.

Guaiacum was the original Indian remedy. In Spain it was called *palo santo*, or holy wood. In Italy it was called *legno santo*, also holy wood. The Latin writers called it *lignum sancto*, *lignum indicum*, or *liknum vitæ*. In Germany after its introduction was established, the name wood was associated with the disease for which it was supposed to be a specific, and there it was known as *Franzosenbaum* or *Pockenholzbaum*.

The earliest work on the wood was written by Nicholas Pol,<sup>3</sup> a physician to Charles V of Spain. It appeared in 1517 under the title: "The cure of *morbis gallicus* by the wood Guaiacum" (*De Cura Morbi Gallici, per lignum Guayanum, libellus*). It was a short work of some nine chapters, but it set forth a regimen and a treatment by the wood which was consistently followed thereafter. It announced that some 3,000 Spaniards had been recently cured of *morbis gallicus*, or syphilis, by means of Guaiacum after many of them had tried a great number of remedies without benefit. Some who had despaired of a cure had been restored to health through its marvelous properties.

The method of preparing the wood is to make a decoction, the wood being hard, heavier than water, incapable of being split, had to be attacked with hammers, chisels, and such tools.

The length of time to effect a cure differs so much in different individuals that this must be determined in each case. The poorer sort of Indians kept themselves on a low diet, and were generally cured in 10 days' time. But the better sort of Indians, although they too undertook the low diet, yet they allowed themselves more liberty, and in them the cure usually took a month.

The Spaniards, on the other hand, were cured by the decoction in 15 days, sometimes not less than 40 days, and occasionally a few as long as 60 days. But some Germans, he adds, are so worn out with the use of mercury, that the wood has no effect on them. In Spain it was customary to give a cyathus of a strong decoction of Guaiacum three times a day, the patient constantly keeping his bed,

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<sup>3</sup> Nicolaus Pol or Poll was born about 1470. His work is dated Dec. 10, 1517, or about 1 year previous to the death of the Emperor Maximilian. He seems to have obtained his degree from Vienna in 1494, held a professorship in medicine, and was physician to the Emperor. The fame of the use and virtues of guaiacum, then known in Spain as the holy wood, had spread into Germany, and the Emperor Maximilian dispatched a commission, one of the most important members of which was Cardinal Matthew Lang, Bishop of Gurk, for the purpose of securing information of it for German sufferers. Dr. Pol appears to have been one of the physicians chosen to accompany the cardinal, and the dedicatory letter preceeding Dr. Pol's work is addressed to this churchman. Dr. Pol died at his residence in Tyrol sometime after 1527. More than 30 books of his library, written by some 23 authors, are owned by the Cleveland Medical Library, Cleveland, Ohio.

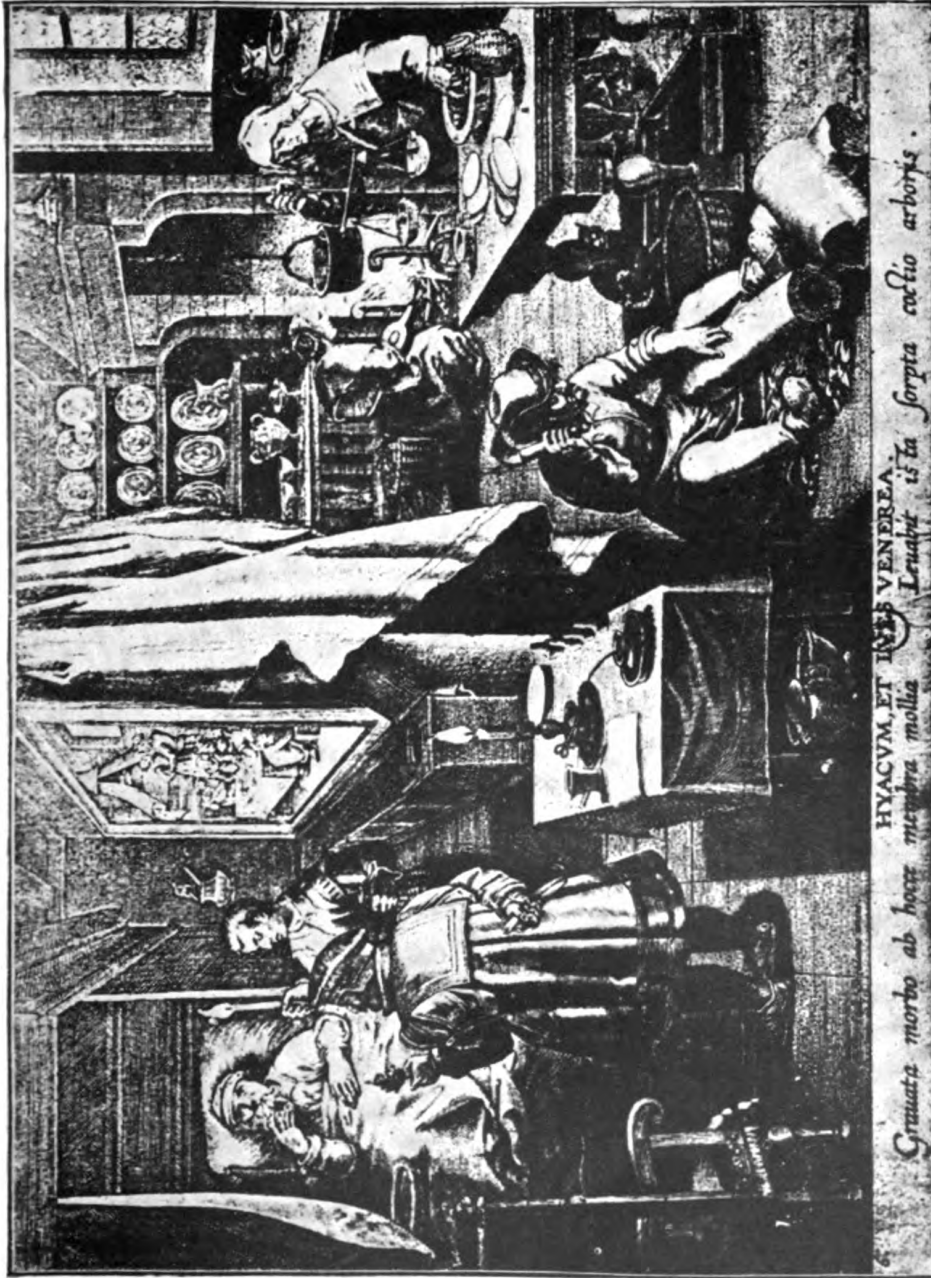
taking no more food than a little biscuit with prunes or raisins, and drinking only of the decoction. After the patient had continued 8 or 9 days under this regimen, he was allowed for 6 or 7 following days the yolk of an egg, and successively for the succeeding 20 or 25 days, a little chicken flesh for dinner and supper. The course of treatment took 40 days. By this means the pains were removed, and the ulcers, though reaching to the bones were cured, or, if not wholly cured during the 40 days of regimen and treatment by the decoction, they would be healed soon afterward.

In short, anyone who had been affected with the disease, even though it had existed for 10 years or so, with extensive and deep ulceration, may expect a cure with the decoction and regimen as outlined. It was essential, however, that the decoction be freshly prepared, at least every 2 or 3 days, and, he informs us it works by promoting the sweat, the urine, the stool, and the vomit. It was no wonder, therefore, a book appearing in France shortly afterward, and often called the first French book on syphilis, referred to this regimen and treatment as A Lenten Purgatory of Expiation, etc.

There was no hint of the importation of the disease by Columbus, but he says the Spaniards call Guaiacum the holy wood. And this recommendation of a physician of the King of Spain of a marvelous new drug, from a new country, for a disease long abandoned by physicians to the care of surgeons, set forth its virtues in florid terms.

The following year, 1518, a book appeared by Leonard Schmaus, of Saltzburg, describing the new cure for the *morbis gallicus* with the Indian wood (*Lucubrationcula de morbo gallico et cura ejus noviter repeta cum ligno indico*). Schmaus makes no mention of Columbus, nor does he call the wood a holy wood. He mentions that there had long been a dispute if the disease was the elephantiasis, lichens, asaphati, prunum, or Persian fire. And that recently merchants introducing the wood had informed the doctors that the Indians had suffered from the disease many years and had always used the wood for its cure. It does not appear that the works of Pol and Schmaus, both of which were written in Latin, were ever so popular, or translated into the vulgate as frequently as the book written by a layman the following year.

Ulrich von Hutten (1488–1523) a German, produced a work in 1519, dedicated to Cardinal Albert of Bradenburg, on the medicine Guaiacum, and the *morbis gallicus* (*De Guaiaci Medicina & Morbo Gallico*). Although appearing in Latin, it was promptly translated into his native tongue as well as other languages. The translation into French of Jehan Cheradame was produced in Paris without date, but is ascribed by Astruc before the year 1530. The edition in English was translated by Thomas Paynell, a canon of



THE PREPARATION AND ADMINISTRATION OF THE HOLY WOOD.

Copper-plate of Jean Stadanus, 1570, Bibl. Nat. Paris.



"Martyns abbe" in the year 1533 with the title: "Of the Wood called Guaiacum, that healeth the Frenche-pockes, and also helpeth the goute in the feet, stoone, the palsey, lepre, dropsey, fallynge evyll, and other diseases." As to the prevalence of these "Frenche-pockes" in England, Paynell says, "For almost into every part of this realme this mooste foul and peyneful disease is crepte, and manye soore infected therewith."

We omit reference to the life of Von Hutten, for his works have been published in seven volumes.

Briefly: Von Hutten had been sickly since childhood. He declares that he had suffered from this French disease, or *blattern* as it was also known in Germany, since he was 8 years old. Now he had found a wonderful remedy in this Indian wood. The disease he says originated in Naples in 1493, which was before Charles VIII undertook his campaign, as he did not arrive at Naples until February 22, 1495. He does not mention Spain as the source of the disease, or Columbus, or the part he might have played in the importation of the disease into Europe. He says it appeared in the army of Charles VIII at Naples, and in France about the same time. The disease spread with magic rapidity and reached this little 8-year-old boy in Hesse near Fulva by 1496. For not long after the disease appeared in Italy, it made its appearance in Germany, where, he tells us, it prevailed more than in any other country in Europe. This he ascribed to national intemperance, explaining that Germans indulge themselves to excess both in eating and drinking, and as a consequence they suffer the most violent symptoms and labor longest under the disease. The physicians shunned the sight of it and avoided any contact with persons suffering of it. He holds the art of physic in contempt, telling us that for 2 years after it broke out the affected depended wholly upon the blundering assistance of the surgeons.

During the first 7 or more years after the disease appeared in Germany it spread to those who had no contact with the infected, but at the time he was writing (1519) it had changed its character and was spread mostly by coition, and, furthermore, its abominable vileness was abated. The ulcers, as he calls them, resembled acorns in their figure and size, but recently they were not so large, not so prominent, or not so hard, although sometimes the disease assumes a worse shape and covers the skin with a dry, scaly, spreading scab.

At the time of its first appearance philosophers generally agreed that lakes, rivers, springs, and even seas were corrupted by some poisonous ferment in the air, which was thence communicated to the bodies of animals. This view was in thorough accord with the teaching of the learned Niccolo Leonicensis, 1497, and Simon Pisor

at Leipsig, 1499. It is also in accord with the remarkable account of Ruiz Diaz de Isla.

Space prevents us recounting the tortures of the long years of treatment he underwent. His 11 salivations with mercury, his experience swallowing alum and turpentine, and his long and harrowing list of purges. All these accomplished was to make the disease tolerable without extirpating it. This task remained for Guaiacum, which alone performed it. This wood alone was sufficient to cure the French disease, and, furthermore, its virtues were not increased by compounding it with any other drug, but, on the contrary, its efficiency may thus be diminished. In the space of 40 days by the use of the decoction he was cured and the ulcers healed.

This, briefly, is an account of Von Hutten's part in introducing this remedy, and it seems sad to contemplate that with all his earnest effort to contribute to the relief of mankind, in the end, overwhelmed with disease, discouragement, poverty, and persecution, he should die deserted and alone of the disease the cure of which his book so widely exploited.

The earliest Spanish account of the virtues of the holy wood appeared in the *Summaria* of another layman, Gonsalvo Fernandez Oviedo y Valdez. Many Spanish writers refer to Nicolas Pol as a Spaniard. Peter Martyr, a member of the Council of the Indies, makes no mention of the virtues of the wood in an earlier work (*De Rebus, Oceanicis et Novo Orbe*). The first part of his work, dealing with the first decade appeared in 1511, his account of the second and third decades were printed November 9, 1516. He mentions a remarkable trained hunting fish which the Indians called Guaicanum, the nearest approach to the name. The wood he simply mentions as a hard polished wood converted into utensils by the Indians, and which he says John Baptiste Elisius, physician to Charles V, identified with hebene. He says nothing of its medicinal properties. Oviedo says some persons call Guaiacum "*hebaeno*." Other later writers identified it with the *ebenus* of Pliny and Dioscorides.

The *Summaria* of the Natural History of the Indies by Oviedo appeared at Toledo, 1526. He was in Spain on a vacation at the time, and this *Summaria* was a compilation from memory, written for the information of Charles V, his papers so he tells us being at San Domingo city, along with his wife and children. This *Summaria* contained a chapter entitled "The Holy Wood, which the Indians Call Guaiacum" (Cap. lxxv. *Del Palo Santo, al cual los indios llaman guayacan*). This description coming out of Spain was regarded as authoritative. Now it becomes the holy wood, and Christopher Columbus is charged with the importation of the disease for which it was a specific. The work was soon translated into other languages, a partial translation into English was made by Richard Eden, and

appeared in 1555. The first part of Oviedo's larger work (*La historia general de las Indias*) appeared in Seville in 1535, before the work of Ruiz Diaz de Isla, but was not completely published until recent time (1851-55).

Born in 1478, Oviedo was a lad 15 years of age when Columbus returned from his first voyage. This 15-year-old boy is credited with making a first-hand investigation into a disease which Nicolaus Scillacio, 1495, tells us came out of France and baffled the physicians of Barcelona, and which Ruiz Diaz de Isla tells us utterly mystified the physicians of Seville until their problem of treatment was solved for them by a humble maker of blankets, named Gonzalo Diaz. Many moderns credit the physicians of that time with abysmal ignorance, not giving recognition to the fact some of the more valient were struggling to unlearn the false theory of the *alhumeria* on which their system was built.

Oviedo tells us the disease is common among the Indians, but not so violent or dangerous among them as in Spain and other countries not in the tropics. The Indians easily got rid of the disease by means of Guaiacum. (*Puede vuestra magistad tener por cierto que aquesta enfermedad vino de las Indias, y es muy comun á los Indios, pero no peligrosa tanto en aquellas partes como en estas; antes muy facilmente los Indios se curan en las islas con este palo, y en Tierra-Firme con otras yerbas ó cosas que allos saben porque son muy grandes herbolarios.*)

And then later he tells this guaiac cures the bubas (the Spanish name for syphilis) more perfectly than any other medicine, "for", says Oviedo, "Divine clemency is so great that wherever it allows us to suffer for our sins it grants that there should be found likewise the remedies for this suffering" (*porque es tanta la clemencia divina que á donde quiera que permite por nuestras culpas nuestros trabajos, alli á par remedios con su misericordia*).

We will refer to the work of Oviedo again.

In 1527 Jacques de Bethencourt published what is often called the first French work treating of syphilis. It dealt with the treatment by guaiacum and its title in English is: "A new Lentenlike Penance and Purgatory of Expiation for Usage of Patients Affected With the French or Venereal Disease." Bethencourt was one of the first to call the disease, venereal disease, a name for obvious reasons quickly adopted by his countrymen, the French, for the present name, syphilis, had not been introduced by Fracastorius, and this name was not generally adopted until 200 years later. Now that chancroid and gonorrhea, along with some other diseases, has been separated out of that potpourri called *morbus gallicum*, the name syphilis is more appropriate.

Astruc and others, calling this work of Bethencourt the first French tract on syphilis, for some reason ignore this status of a work published in the vulgate at Lyons more than a quarter of a century earlier, entitled "Three Remedies Used for the Cure of the Disease Which is Called in Hebrew Mal Franzos, and in Latin Chronic Smallpox, and in French *la grosse verolle*" (*Remede tres utile pour ceulx, qui ont la maladie apellee en Hebreu Mal Franzos, & in Latin Variola croniqua, & in Francois la grosse verolle, imprime a Lyon, le IX jour de Junig, l'an Mil cinq cens & ung*).

In Italy in 1528 Francisco Delgado, a Spanish priest of the diocese of Cordoba, and abbe of Lampillas, published at Rome with permission of Pope Clement VII, in the Italian tongue, a work on the holy wood (*Del modo di adoperare il Legno Santo, ovrero del modo di guarire il Mal Francese ed ogni mal incurabile*). Delgado tells us he suffered from the disease since 1503 and for a while had been a patient at the hospital of St. James the Apostle in Rome. For 23 years he suffered excruciating pains and incurable complaints until 1526, when he had been restored to health by the holy wood. In the fifth chapter of his work he says the holy wood had been known in Spain since 1508, and in Italy since 1517.

We have now briefly mentioned how the virtues of the holy wood had been set forth in Latin, Spanish, German, French, and the Italian languages. From this point on works frequently appear setting forth its efficacy. Hardly a book during the sixteenth century, treating of the disease, omits a glowing account of its marvelous properties. And this continued until the humoral theory began to totter, taking with it the elaborate theories of the third or fourth digestion. Boerhaave, in praising it, says it will act as a purge, reaching places that mercury cannot reach, and there dissolve the poison. Anthony Gallus, of Paris, says it has cured a most violent *morbis gallicus* in 9 days' time. Particularly did Guaiacum increase in its popularity when the reaction set in against mercury, for since remote time mercury and arsenic disguised under various names, as at present, have each been repeatedly discarded in the treatment of this disease. The surgeons who have been treating the disease with mercury through the middle ages, were reviled as montebanks, and empirics, if not by worse names, and the physicians sailed into the picture on a resinous sea of the decoction of Guaiacum.

The surgeon, Michael Angelus Blondus (1542), who believed in the great European antiquity of syphilis was one of the first to criticize the use of the wood. He confesses that his patients under the lenten penance and purgatory of starvation became as bloodless as so many ghosts, and ere the moon had completed its orb many relapsed into a worse condition. As to the disease syphilis, he identi-



fied it with disease described by Celsus, Paul of Aegina, and others. "Let us not talk then", he writes, "of the disease being brought over to us by Indians thus openly exposing our simplicity by so saying" (*Nec dicamus morbum ab Indis transfretasse ad nos. Quoniam fatuitatem profitebimur, dicentes*).

#### THE EVOLUTION OF THE AMERICAN ORIGIN THEORY

The association of Christopher Columbus and the American origin of syphilis is a theory not a fact. It was evolved vaguely, for the first writers residing outside of Spain confused the first voyage of Columbus with the voyage of Vasco da Gama to India, which was not completed until 1499, by which time all over Germany, Spain, Italy, and France note was being taken of the disease. Nicolas Massa, one of the first of the able syphilographers, tells us that the holy wood came from Calicut and that it was commonly believed that Columbus' soldiers upon their return were sent to Naples and there communicated the disease.

The earliest writers attributed the origin of the disease to the astrologic conjunction of planets which took place in 1483, 1484, 1487, and other years. It is thus we find the disease ascribed in the works of Jacob Grunpeck, Bartholomeus Steber, Wendelin Hock, and in the famous drawing of the syphilitic by Albrecht Dürer (1496). Conjunctions in other and subsequent years, frequently mentioned, only added to the confusion of the astrologic theory. Leonicensus introduced the theory of a hot and moist season, for he noted the similarity of the symptoms with a grouping in the seasonal aphorisms of Hippocrates. Others claimed it was an occult essence in the air. All this led to dissertations at the schools. At Ferrara in 1497 Niccolo Leonicensus held forth against such opponents as Sebastian Aquilanus, who learnedly pointed out that the venereal features of the disease were of great antiquity. At Leipzig in 1499 Simon Pisor by his elaborate syllogisms arrived at the conclusion that the disease was spread through an occult essence in the air. Several broadsides were exchanged between Pisor and Martin Mallerstadt. At Salamanca, the dissertation with the learned doctor who believed the disease to be asaphati, an arabic term for a skin manifestation of so-called leprosy, is extensively set forth by Francisco Villalobos in his poem on the Pestiferous Buvas published in 1499. An examination of these works arouses the same suspicions one gets from the books on the holy wood, that these authors are discussing not syphilis only, or rather the group of venereal diseases of that date, but also certain epidemic conditions of high mortality, later to be separated from syphilis in the same manner that the *morbus gallicus* came out of that dermatologic

potpourri, caused by every one of the four humors, and called leprosy.

Not until the year of 1525 in the published letter of John Manard (1462–1536) to the surgeon Michael Sanctannam, published at Venice, is the disease vaguely ascribed to the newly discovered countries. He is not sure, however, and is more inclined to another theory which he describes at greater length, and which derives the disease from leprosy and spreads it through the agency of the army of Charles VIII.

Iwan Bloch says that Manard and Ruiz Diaz de Isla are his authorities for the statement that many Spaniards were in the army of Charles VIII who shortly before served in the army of Ferdinand the Catholic in Roussillon, and fought against the French King, Charles VIII, and who after peace joined the latter's army (*Vor allem ist der Umstand wichtig, dass zahlreiche Spanier sich im Heere Karls VIII befanden. Dies berichten auch zwei andere Zeitgenossen, Diaz de Isla und Manardus. Viel Spanische Soldaten, die kurz vorher unter Ferdinand dem Katholischen in Roussillon gegen Karl VIII gekämpft hatten liessen sich nach dem Friedensschlusse von diesem anwerben. Der Ursprung der Syphilis*, Iwan Bloch, pp. 141).

Roussillon had formerly been a part of the Catalan Kingdom of Ferdinand. It had been pawned to Louis XI, father of Charles VIII. Charles returned it to Ferdinand by a treaty, in consideration that Ferdinand would not interfere with his proposed expedition against the Turk, which ended at Naples. This treaty was signed January 19, 1493, by Ferdinand at Barcelona and by Charles VIII at far-away Tours. Roussillon was thus returned to Aragon before Columbus returned from his first voyage, and the Spanish sovereigns at the time of his return were at their Catalan capitol, Barcelona, arranging the taking back of their pawned Province. It was a proceeding without battles, and there is no statement in the work by Ruiz Diaz de Isla, which connects the return of Columbus with the army of Charles VIII, in the manner referred to by Bloch.

The following is the account of Manard:

There are those, indeed, who say the disease is not new, but that it came from an island anciently unknown, where it is widespread among the inhabitants and that it came to us from thence through Spain, to whom this island belongs.

Or, on the other hand, and this is the older view supported by the greater number of authorities, it had its beginning at the time when Charles, the King of France, made ready the Italian expedition; for it began according to this opinion at Valencia, a famous city of the Province of Tarragona in Spain, from a high-born prostitute who for 50 pieces of gold gave a night to an officer of the cavalry who suffered from elephantiasis. And among the youth who frequently resorted to and lay with this woman, after a few days, more than 400 were infected, and several of this number joined the force of Charles

in Gallico morbo, vel ipsomet Leoniceuo teste, rarissimum. Sed cur frustra laboro, quum Galen. ipse hunc litem dirimat, statim in primo verbo enarrationis sue in hanc Epidemiam, constitutionem, de qua Hipp. meminit, petilentem nominans? Ita enim ad verbum loquitur: *Petilentem constitutionem in hoc loco scribit Hipp. &c. Et alio loco, exponens verba illa Hipp. "Est mihi interire, ait: Petilentem fuisse morbum, qui vagabatur, ostendit, dicit eo quod dicit, Est mihi interire. Iam igitur longe abest ab ea constitutione Gallicus morbus quam longe abest a petilentia & mortalitate. Scio futuros, qui mihi visio dent, quod in re tam aperta anxie nimis & scrupulose pugnaverim.*

Præter igitur & vincat veritas propriis viribus nixa, diversos quidem affectus hujus morbi esse signatim ab antiquis scriptis, connexionem vero eorum & sequelam à nomine fuisse scriptis demandatam. Nec pergant homines in aere vel in coelo causas morbi perquirere, sed in aëris coelestis moderatorem, hoc morbo flagitia hominum, libidinem præcipue & linguæ petulantiam punientem, (scilicet enim à genitalibus incipit lues & in os defuit) & insufficientis intellectus corporis natura, causas & differentias hujus morbi perquirant. Hugo Senensis, inter omnes, quos hæcenus legi, salutis ejusmodi juvenis per scripturam consuluit, qui prope hunc morbum videtur accessisse. Pafius enim est pustulas, tumores duros, ulcera, capitisque & diversorum membrorum dolores, noctu etiam magis quam interdiu affligentes ita, ut caruisset tantum pulsulis genitalium & capitis inter capillos videatur, quæ tamen sunt vel primæ, vel maxime hujus morbi propriæ. Curatio autem, quæ ei passim ab imperiti, præsertim per argentum vivum & minimum adhibetur, ab eo morbo accepta est, quem recentiores Chirurgici malam (cabien, & malum mortuum appellat, alium tamen longe ab hoc morbo. Sed dixerit forte quispiam: Si hic morbus nonnisi per concubitus contagium generatur, quo pacto primum novus coepit? videtur enim duo hæc invicem repugnare, quod scilicet novus sit, & quod per solum contagium innascitur. Si enim novus est, coepit primo, nec prius erat, à quo posset per

Unde si autem  
capa vulgari  
in Gallico  
morte causa  
est.

Michael Gal-  
lenus quon-  
modo novus  
dixisse, si  
autem per  
contagium  
generatur.

A contagium derivari. Si per contagium coepit, non potest novus esse, quia necessario in eo fuit, quo est per contagium derivatus. Duplitem hic posuimus respondere, juxta duplicem historiam de ejus origine. Sunt enim qui dicant novum non simpliciter esse, sed ex insula quam antiquis incognita, ubi frequentissimus est, in hanc, quam nos incolimus, habitabilis terræ portionem per Hispanos, qui illuc navigaverunt, importatum principio apparuisse. Alii sunt, & hæc est antiquior sententia, & majoribus fulta testimonio, qui coepisse hunc morbum per id tempus dicunt, quo Carolus Francorum rex expeditionem Italianam parabat: coepisse autem in Valentia Hispaniæ Tarentonensis, insigni civitate, à nobili quodam scorto, cujus novitas etiam elephantiosus quidam ex equestri ordine miles quinquaginta aureis emit, & cum ad mulieris concubitum frequens juvenis accederet, intra paucos dies supra quadringentos infectos, & quorum numero nonnulli Carolum Italianam petentem sequuti. Præter alia, quæ adhuc vigent, importata mala, & hoc addiderunt, inter minima non deputandum. Quæ historia si vera sit, ut ego non laevius credo, novus simul erit, & per contagium ortus: non alterius hominis eodem affecti, sed elephantiasis, quæ in hunc quasi degeneraverit, & de suo gradu in proximum decidit. Minus autem de hoc mirabitur, quicunque apud recentiores legerit, eos, qui mulieri coierint, quæ parum antea cuncti leproso (sic enim elephantium vocant) rem habuerit, femine quidem adhuc in utero manente, elephantiasim quandoque incurere, quandoque non, sed alias oblationes majores, minoresve, prout & ipsi affecti sunt, & elephantiosus ille, qui mulierem intecit. Hæc igitur sunt, quæ de morbo Gallico hæcenus potui intelligere. Curam ejus in aliud tempus & locum distulimus, neque enim nunc morborum curam, sed nomina tantum inquisivimus: Tu vero Michael hæc diu desiderata lætore facie suscipe: solent enim, quæ longo tempore desideravimus, esse gratiora, tarditatisque culpam non in voluntatem, alioqui tibi propensissimam, sed in meam valetudinem, variasque occupationes rejice. Vale. Ferrarie.

Gallico morbo  
causa.

Michael Gal-  
lenus quon-  
modo novus  
dixisse, si  
autem per  
contagium  
generatur.

JOHN MANARD'S LETTER TO MICHAEL SANCTANNAM. WRITTEN FROM FERRARA 1525.

The part attributing the disease to an island of Spain, or to a Valentin Prostitute.



and followed him into Italy, and thus the evil was introduced and flourished, among others of which this is not the least. If this account be true, which I believe it is, I would not incline to credit it were it not that recently, through this contagious manner of origin, some men have been thus affected, though the elephantiasis may have degenerated into a different variety. Nevertheless, recent writers have observed that a woman who has to do with a leper (which disease is also called elephantiasis), they who cohabit with this female in whose womb the poison of elephantiasis has remained, are often infected with a more violent or a less severe type of the disease than the leper by whom the woman was infected.

There is nothing in this account of Manard about Roussillon, or about Barcelona, located on the opposite side of the Pyrenees. Valencia is more than 120 miles further distant than Barcelona, and a long journey in those days. On the other hand, Charles army was mobilized in far-away Vienne, on the banks of the Rhone, separated from these cities by that natural barrier of the Pyrenees. As to the prostitute infecting 400 youth *in the space of a few days*, at the rate she obtained her infection, the task would take over 13 months. The account omits to connect her in any way with America, or Columbus, his Indians, or any of his crew. It is incomprehensible how any experienced syphilographer could give credence to such a yarn in connection with the disease we know today as syphilis, yet it is sad to note that Bloch offers this account as evidence of the American origin of syphilis.

We now turn again to the account of Oviedo. His early account in the Summaria differs from the passage in his later Natural History, extracted by Montejo, and made available to American readers by the careful translations of Williams, Rice, and Lacayo (*Arch. of Derm. and Syph. vol. 16, 1927, p. 683*). Montejo avoids the passage in Oviedo's work in which he notes that the two plagues of which he was writing (bubas and chigoes) made their appearance the second voyage. However, the persons mentioned by Oviedo, did not go the first voyage, with the exception of Vincente Ynez Pinzon. What Vincente may have told him or what others may have told him is so confused and indefinite, that it would be impossible to construct any intelligible evidence from it. The only place where he says anything definite about the element time (for evidence should be definite as to time, place, and person) is when he says the two plagues of which he writes (bubas and chigoes) made their appearance the second voyage of Columbus (*me parece que de me podria notar a descuydo dexar de decir dos plagas nuevas que los chrisptianos en este secundo viage des almirante padescieron, etc.*).

Oviedo, a layman testifies that it first affected only low persons. Three contemporaneous Spanish physicians, on their professional experience testify the opposite. Gaspar Torrella, writing more than

20 years earlier, says that in Spain the disease followed the court, and was known in Spain as the court disease (*in ulteriori Hispania morbum curialem vocant, eo quia curiam insequitur*). The satires of the Spanish physician Gaspar Lucas Hidalgo, a man probably older than Oviedo, declares the bubas is a disease of court dames, and not of rustics. Another Spanish physician, Aloysius Lobera, contemporaneous with Oviedo, and a physician to Charles V of Spain, published a book under the Title of the Four Court Diseases, one of which was the bubas (*De las quatro enfermedades cortesanas gota artetica, sciatica, males de piedra riñones y hijada, y mal de bubas*. 1544 Toledi apud Ludovicum Ayala). Therefore each must decide which they will accept, the gossip of the layman Oviedo or the experience of these physicians.

Outside of Spain Oviedo's account was unnoticed for a while. Latin writers were too certain that the pestiferous conditions were spread through the disorders coincident with the invasion of Charles VIII, which was a logical theory, even if the disease slumbered only where prostitution flourished. Pestilences, they believed, arose out of astrologic influences. It was not until thinking physicians realized that the fable about Charles VIII was an anachronism and untentable that they sought for an earlier cause. One can hardly blame Astruc for the labor he expended to wash the unjust stain of the so-called "French disease" from the escutcheon of France though the means he took to do this threw another barrier to the rational study of the disease in its true evolutionary perspective.

Petrus Andraes Matthiolus, of Siena, writing in 1536, vastly improved the story of the infection of the army of Charles by a leprous prostitute, for he gave the task to a leprous person on Mount Salvius where she might be nearer the scene of activities, than in far-off Valencia in Spain. Here again we note the disease as an offshoot from leprosy (*Nonnulli Morbum Gallos, cum per montem Salvium iter facerent, a foeminis leprosis per coitum primitus contraxisse, eorum postea intemperantia atram bilem pituitamque procurante, memoriae prodiderunt*). The idea that the disease originated from a leper was becoming quite common. Some assumed it was generated through the union of the poison of leprosy and the ancient elephantiasis (*greacorum*), which is the same disease; similarly says Paracelsus as a mule results from union of an ass with a horse.

The next writer was Ruiz Diaz de Isla, a Spanish surgeon, who produced a work in 1539 on what he called the Serpentine Disease. I am well aware that German, French, and American authors, following the Spaniard Montejo, refer this work to the year 1510, and at latest 1520. This is repeatedly refuted by the text of the author, who frequently states he had 40 years' experience in the treatment of the disease, which would thus place his experience with the disease

## Capítulo trezeno

clara: la de esta clarificación entre la gúda y la ter-  
cera especie: dice que la gúda especie peca par-  
ticularmente y la tercera especie peca general-  
mente. e esto dice el autor que la segunda especie  
es error de la virtud digestiva del boga-  
dor: quando empieza de venir la segunda es-  
pecie corrompe la digestión del boga-  
dor de baya en chulo muy perfecto a manera de  
un buel vino baxo un vino no aplayable a  
los miedos y miedos que no pasa mas allá  
de cōfite digestión aun que errada el mien-  
do de la digestión el mantenimiento que es  
ebrio y el haconolo puede digerir y pa-  
dece dolor y apostema y vlcera: y por tanto  
se pone que la segunda especie peca particu-  
larmente: y quando este vino se corrompe  
mas adelante y se pasa en vinagre: los  
boyes alteración en los espūs y causa la fiebre  
y el cōsumimiento de los miedos y peca ge-  
neralmente por la por y qual cōfite todo el  
cuerpo: e así es la buena la discreción que  
que la gúda especie peca particularmente: la  
tercera generalmente.

<sup>21</sup> En la clarificación de la clarificación dice el au-  
tor que dentro de .xx. años toma la segunda espe-  
cie después de aver tenido la primera y que ha-  
vista algunos venir a los .xx. años y que vi-  
do a uno que vino a los .xx. años y que fue  
mado que a uno le avisó de la segunda espe-  
cie a los .xl. años: por que no se cura cōfite:  
por que puede acōtrecer entre mal vino y por lo  
mas le toma el todo no e bargate que por vino  
ter de buena cōplución y muy regidor el co-  
to o por le ayudar alguna ppeidad iduadu-  
al lo que los otros cōsumente tiene e entro  
de los dichos .xx. años le veiga a este tal a los  
xxx. y algo mas por que y o a .xl. años que curo  
esta enfermedad y no be visto ni oydo re-  
ir pasar de: pñon de los dichos .xx. años

<sup>22</sup> Y esto que dice si discretamente lo que me-  
surar todo sale a una cuenta: e esto digo por que  
si uno tiene una buba en el becho de la boca y  
beue por un jarro o cō una taza o otra vasija  
o cōfite: la gte de aquella vasija cō que beue si le  
boca de la buba allí llena pegada a la vasija la  
linda: va otro y beue cō aquél vaso y la gte de  
la boca o de le toca la virelencia que la vasija  
esta apañado de inficionado allí le nace se  
le apegale primera lina: y por esto digo que

no discretamente lo que me-  
surar: e todo  
sale a una cuenta: que mas me da que to-  
la buba  
de la carne de la fano pa que apegue  
que tocalle un cáto o un jarro que a una tocado  
la buba de inficionado y lleuase allí el der-  
licor o virelencia que todo sale a una cuenta.

En la primera lina de cap. .ii. y primera es-  
pecie de los be-  
acōplucionados digo que quanto  
a las frutas puede comer de todas y que a es-  
to peca a algunos mal: por digo que los de pri-  
mera especie por la mayor parte se sanan de si-  
mismos así que téga alguna dōdad y no guar-  
de regimiento: y pues así es basta tirar les  
las malas frutas y darles las buenas té-  
pladamente: e así mismo otro tanto digo de las  
duras de aquéllas que tienen fama de buenas.

Digo de la pñonificación de la segunda especie que  
todos los bōbres que son tocados de la segunda  
especie por la gte que tienen mugre e forzosas  
mueren de esta enfermedad: esto se entiende por  
los casados o otras pñonas que si uno tienen  
ayuntamiento no se querē apartar de lo que les  
causa no se puede curar ni se curan y  
la dōdad que quando el buel hūco o mugre no to-  
pare cō los se mēta e efermece le cōuene  
tener cō ellos muy grande pñonificación por  
que por muy buena que la téga la mud de los se  
mēta e efermece que separe le e a de se-  
cer de los por bōde la cura y a efermece e cō  
uene le: cō el le tener grā pñonificación.

En la segunda lina de cap. .iii. que trata de  
la segunda especie ekrmo la mētra que se be de  
ner cō los pacētes en el modo de purgar cō  
los laxatūcos que se tomā por la boca: lo que se  
gū que lo be ekrmo y o se por muy e cōpasia  
de grādes hūcos: especialmente en el fano  
ospital: el que el modor lina y o se por mas de  
xxx. años. A los ekrmo en el cap. de los pñe-  
tos y reglas generales en el pñeto que po-  
esta enfermedad de todo de todo: a ekrmo de  
los laxatūcos por que ellos nigh pñeto be-  
ller por que ellos son dos cōtrarios me pñeto  
que be de ekrmo en la ruder e rigo así que y o a  
xl. años que curo esta enfermedad: así por mí  
como e cōpasia de grādes hūcos y los .xxx.  
años e cōfiteamos lo que ekrmo de la segunda  
lina de cap. .iii. y de .x. años era de lina por  
cōfite no purgar nigh efermece gū que lo  
digo en el pñeto pñeto y e reglas generales de lo

TEXT OF RUIZ DIAZ DE ISLA. FOLIO LIII. PUBLISHED SEVILLE 1539.

Four times on this page he refers to 40 years experience with the disease. (Permission Henry E. Hunt-  
ington Library, San Marino, Calif.)





since 1470 or 1480, or from 12 to 22 years before Columbus undertook his first voyage. On one folio he makes this statement, or a statement to this effect no less than four times. I have dealt more fully with this author in another paper. Ruiz de Isla said the word bubas was in common use 10 years before the disease appeared, which is borne out by the poem, *The Dance of Death*, the Spanish version being the oldest, and which was written more than a half century before the first voyage of Columbus. This poem assigns death from bubas to one of the victims. Ruiz de Isla says the disease is a form of leprosy and is identical with *Mentagra* as described by Pliny the first century after Christ. His text has been erroneously interpreted that he was in Barcelona in 1493 when Columbus returned from his first voyage. As Ruiz de Isla wrote more than a decade after his countrymen, Oviedo, the charge against Columbus and his crew was well known. His serpentine disease was so very contagious that it took off 10 persons out of every 100. Few were able to escape it. Montejo refers to a passage in the manuscript of the book, which is omitted from the printed text. This passage mentions that the disease appeared in a pilot of Palos called Pinzon, and certain authors have leaped at the conclusion that this Pinzon was a patient of Ruiz de Isla. One American author in his book is especially exact and indicates that this pilot was Martin Alonzo Pinzon. Now, at last we have arrived at something definite. Could it have been this Martin Alonzo Pinzon who brought the infection to Barcelona, and precipitated a violent European epidemic of the disease?

Montejo, contrary to most accounts, claims that Columbus took his ships to Barcelona. He reasons that the overland journey from Palos was too hazardous and difficult, and, ignoring the fact that Columbus' account of the voyage ends with the arrival at Palos, brings the fleet around to Barcelona in order to infect that city, so it might agree with his interpretation of Ruiz de Isla.

It is necessary now to give some account of the voyage of Columbus.

Columbus sailed from Palos August 3, 1492, with three ships. These were the *Niña*, a tiny vessel of about 40 tons, named after its owners, the Niña family, and commanded by Vincente Ynez Pinzon, with three of the Niña family on board, one as a pilot, another as master, and a third as a seaman. This is the vessel that brought Columbus back from America. It had a crew of 18 persons.

The *Pinta* was slightly larger, approximately of 50 tons, and was owned by two sailors who went along, and it was commanded by Martin Alonzo Pinzon. It too carried 18 persons.

The third and largest vessel was of 100 tons. It was owned by Juan de Cosa, of Santoña. Columbus never mentions its name. Oviedo calls it the *Gallega*, and Herrera the *Santa Maria*, by which name it is most generally known. It carried 52 persons, making 88

in all. This vessel never returned from America, for it ran aground and was wrecked on Christmas Day 1492 off the coast of Haiti.

At the time of the wreck Martin Alonzo Pinzon, with the *Pinta*, was absent without leave. Columbus notes he had disappeared November 21, more than a month before, "out of avarice, thinking that an Indian who had been put on board his caravel, could show him where there was much gold."

Columbus now had only the tiny *Niña* left. He built a fort ashore of the wreckage and left 39 persons there, according to his journal, and started for home. A list published a few years after his return names 44 left behind, all of whom were murdered in the interval between the first and second voyages.

On January 6, 1493, he fell in with Martin Alonzo Pinzon, who excused himself for absence which he claimed was against his will. On the way home they encountered a severe storm. Martin Alonzo Pinzon again deserted, running his vessel out of sight, although Columbus notes he had lanterns shown all night which the *Pinta* answered. Columbus was blown to the Azores. How small his crew was may be judged when he notes in his journal that after sending one-half ashore to church to give thanks for their safe deliverance from their perils, he had but three seamen left on board.

On March 4, he arrived at Lisbon, Portugal, from where he dispatched a letter to the Spanish sovereigns, who were then at Barcelona. This letter is dated March 4, and the reply is dated March 31, so that it consumed less than 27 days to make the journey. In reply the sovereigns directed him to proceed to Barcelona after he had made the necessary arrangements for the next voyage. That the Spanish sovereigns never had any idea of establishing a port of communication other than on the Atlantic littoral, is borne out by their 10 letters or patents, bearing date May 23, 1493. These letters, and other material were published by Narvarrete in his collection of documents relating to the discovery (*Collecion De Los Viages Y Descubrimientos Que Hicieron Por Mar Los Españoles*, Madrid, 1825).

Columbus proceeded from Lisbon *not to Barcelona, but to Palos*, arriving there early the morning of Friday, March 15, 1493. The same day the *Pinta*, which ship had made a landfall at Bayonia in Galicia, arrived in the port of Palos, with the unfortunate Martin Alonzo Pinzon.

Columbus now proceeded to Seville to wait reply from the sovereigns. Seville is up the Guadalquivir River some 54 miles distant from the Atlantic ocean. He brought back with him 10 Indians. One died at sea, and three were so ill they had to be left in Seville. It was at Seville that Las Casas testifies he first saw the Indians.



THE THREE VESSELS OF THE FIRST VOYAGE OF COLUMBUS.

*From an old map of Esprit. The drawing, believed to be by the Admiral. No. 11.*

THE SHIPS OF COLUMBUS. FROM JOURNAL OF CHRISTOPHER COLUMBUS. VOL. 86, FIRST SERIES. HAKLUYT SOCIETY, LONDON.

The tiny ship in the rear brought home Columbus. With the little *Pinta*, it is supposed to have brought home a cargo of syphilis who spread the infection all over Europe in less than 9 months.



Montejo reasons that a journey of 200 leagues overland would consume a long time and be too fatiguing to undertake, and therefore the *Niña*, which was leaking badly, and had discharged the mission for which it was drafted, was refitted and at someone's expense, without lapse of time, cruised through the straits of Gibraltar into the Mediterranean, and reached Barcelona early in May.

The assumption of Montejo is based in part on an ambiguous passage in the text of a book the title of which he was unable to remember, nor was he able to remember the name of the author, nor the year that it was printed. It had originally reposed in one of two libraries, which one he had forgotten, but the few words that he remembered he considered fitted perfectly with an ambiguous phrase on the monument of Fernando Columbus, the natural son of the discoverer. The first passage, recalled after having seen it in 1867, or 14 years previously is as follows:

*Colon llevo o entro en Barcelona el dia 4 de Mayo de 1493* (Columbus arrived where he entered in Barcelona the 4th day of May 1493).

The passage on the monument reads:

*Y volvia a Castilla con victoria a 7 de Mayo del ano siguiente* (and returned to Castile with success, the 7th of May the following year).

With the aid of these two ambiguous gems, Montejo constructs a theory that Columbus did not journey overland to Barcelona, but sailed from Palos arriving at Barcelona early in May, or more than a month and a half after the arrival at Palos (*Congreso Internacional de Americanistas, Actas 4th Reunion, Madrid, 1881, Tomo Primero*, p. 334 to 416).

In the meantime Martin Alonzo Pinzon died in his home at Palos. According to Pusey he is the pilot referred to by Ruiz Diaz de Isla (*History and Epidemiology of Syphilis*, p. 22). Oviedo, one of the star witnesses, notes Martin's death at his house in far away Palos a few days after March 15, 1493, because he was very sick (*Fuesse a Palos a su casa, e murió desde a pocos dias, porque yba muy doliente*. Oviedo II, Cap. VI). Thus the theory of the American origin is perfected at last, by the year 1493, by removing the dead body of Martin Alonzo Pinzon from his house at Palos, and transporting it by sea to Barcelona, where he might be treated by Ruiz Diaz de Isla.

Astruc in his *Nine Books* gives a different account. He, like most others has Columbus march overland. Speaking of the return of Columbus, he says:

From thence (Portugal), with 82 soldiers or sailors and 9 Indians, whom he had brought with him, he returned safe the 13th day of the same month (March) to the same Spanish port named Palos, from whence he had set out,

and marched thence to Barcelona, where the King and Queen of Spain then lay, arriving there April 3, to give an account of the expedition (*Hinc cum 82 sive militibus, sive nautis & novem Indis, quos secum adducebat, incolumis rediit die 13 ejusdem mensis ad eundem Baeticae portum qui Palos dicitur, & inde terrestri itinere pervenit, die tertia mensis Aprilis sequentis, Barcinonem, ubi Rex & Regina Hispaniarum aderant, susceptae navigationis rationem redditurus.* Cap. X).

Assuming for a moment that Montejo is correct (and I believe he is as near correct about the date of Columbus' arrival at Barcelona whether by land or sea as we can estimate), there still remains a task of Hercules for the survivors to spread the disease throughout Europe, for the *grosse verole* was prevailing so extensively in Paris, that March 25, 1493, or 10 days after the arrival of Columbus at Palos, and nearly a month before his arrival at Barcelona, an edict was issued driving all persons afflicted with the disease from the city. An edict in much the same terms for the year 1488 had been directed against *les lepreux*, but after the Bull of Pope Innocent VIII, of 1490, the edicts of 1493, 1496, and 1498, the name of the proscribed disease is changed to *la grosse verole*.

The work of Ruiz Diaz de Isla was little known outside of Spain until George Jerome Welch made it available in a Latin text, giving simply the first part of the first chapter. This translation, which appeared in 1688, is the only part of the work known to Astruc and many other writers. According to Ruiz Diaz de Isla, the serpentine disease spread like wildfire. It was so contagious, he says, that immediately that Columbus arrived at Barcelona the city began to be infected, and the disease spread. Not a town in Spain of 100 but what had 10 deaths. His section devoted to *Essere* as a manifestation of the disease is illuminating. This condition described in the Arabic works of both the eastern and western caliphates, is described by our author as an eruption with fever, progressive emaciation, terminating frequently in death, the patient refusing all food. The sections of his book on the ephemeral and the continued fevers describe his observations with care, detail, and great earnestness, and are worthy of careful consideration, because the pestiferous conditions he describes do not belong to syphilis. Barcelona, according to Villalba, Morejon, and Bascome, had been suffering continuously from pests for several years before the arrival of Columbus.

It is easy to understand when one reads the protean character of Ruiz Diaz de Isla's serpentine disease, how he could fall into the conclusion that Martin Alonzo Pinzon, or any other pilot of the first voyage was so afflicted. Few could escape it. Ruiz Diaz de Isla was no further advanced in a modern conception of pests, pestilences, and contagion than his contemporaries. If we now turn from his account of the wildfire progress of the disease to the simple account

in the journal of Columbus one should be struck by the contrast. No such account of a wildfire pestilence occurs. In this journal he entered every morning and every evening the events of the day. It was first published by the Spanish naval officer Narvarrete about 100 years ago, and Clement Markham has translated it into English for the Hakluyt Society of London.

Columbus began taking Indians aboard his ship October 11, 1492. On November 27, or more than a month and a half later, he made this note in his journal:

I thank our Lord that, up to this time, there had not been a person of my company who has so much as a headache or been in bed from illness, except an old man who has suffered from stone all his life, and he was well again in 2 days. I speak for all three vessels. If it will please God that Your Highness should send learned men out here, they will see the truth of all I have said.

Such a simple first-hand statement from Columbus ought to refute the loose gossip of Columbus' enemies, who charge that his Indians brought the wildfire contagion to Europe. There was no outbreak of disease on board Columbus' ships, and the statement that all or the majority of his crew returned from America infected with syphilis is lamentable slander. Oviedo speaks of Pedro Margarite who limped around complaining so that he suspected that he had the bubas. Pedro Margarite did not go on the first voyage. And Oviedo adds, "I did not see any bubas on him" (*Este caballero mossen Pedro andaba tan doliente é se queixaba tanto, que tambien creo yo que tenia los dolores que suelen tener los que son tocados desta passion, pero no le vi buas algunas*). Even had Pedro Margarite gone on the first voyage the character of Oviedo's evidence would be negative so far as the bubas are concerned.

The physician of the first voyage, Garcia Fernandez, throws no light on the subject. The physician of the second voyage, Diego Alvarez Chanca, has left a splendid narrative addressed to the chapter of Seville, and published by Narvarrete. This narrative, besides throwing light on the sickness of the second voyage, caused by tropical fevers, clears up that mysterious quotation of Montejo credited to Roman Pane. The ships on this voyage had kidnapped some Indian women from the island of Puerto Rico, and they escaped in the night and swam away upon reaching the island of Haiti. All this occurred on the second voyage, and needs no other comment at this time.

As to Montejo's other remarkable accounts, namely those of Saha-gun and Hernandez, written years after the conquest of Mexico by men who took no part in it and who offer Aztec fables about a rabbit and the moon, I do not feel that they deserve serious consideration. Some day it may be possible to show a universal antiquity for syphilis, but we at least know that the first conquistadores had

the bubas in their midst when they first set foot on Mexican soil. Bernal Diaz del Castillo, who accompanied Cortez, and whose work is one of the main sources of the history of the conquest, in his book XVII, chap. 205, gives a biography of many of his companions, mentioning several who had the bubas, at least one of whom he says picked it up in Italy.

One of the first to mention the name of Christopher Columbus outside of Spain in connection with this theory, was John Baptiste Montanus, of Verona, who Astruc says wrote in 1550. He was somewhat hazy on this man Columbus. He had him mixed with Vasco da Gama, but his account found ready acceptance for it brought Columbus' "soldiers", not to Palos, or to Barcelona, but landed them upon their return from "Calicut" right at Naples. He invented a siege of Naples, which still repeatedly erupts itself into the accounts of our historians, although reference to Calicut, the date of Columbus' return from his first voyage, and some other details are slurred over.

Thus we quote his narrative:

In the year of Christ's birth 1492, a certain Columbus, a soldier, with many Spaniards, went to the Indies, then new, which is called Calicut, where there is a certain disease which is widespread in the same manner as scabies is with us. And it happened that while they remained there many Spaniards contracted the same disease which then prevailed in these regions, and returning to us many of our people were infected.

After telling us that the disease although frequent in the Indies was not seen or mentioned by Hippocrates, Galen, or the Arabs, he falls into the same error as Niccolo Massa in ascribing guaiacum, the so-called "antidote" as a wood from these regions. Then he continues his narrative telling how Christopher Columbus returned to Italy in 1496, proceeded to infect the army of Charles VIII and thus the disease spread all over Europe. Now is invented the much quoted siege of Naples. Neither Charles VIII or Columbus were in Italy in 1496.

Accordingly in the year 1496 Columbus returned to Italy and at the same time Charles the King of France proceeded to Naples with a numerous army, and besieged that place for several months. And then as frequently happens at such times, many of those allied together deserted to the enemy and thus these soldiers of Columbus who had also come from the Indies, who brought with them prostitutes with whom they cohabited, as a result of which many were infected. And immediately thereafter the same pest was spread among the Italians, French, and the Spaniards.

Here again we meet the evermultiplying anachronisms. There was no siege of Naples by Charles VIII in 1496 lasting for several months. He left Rome January 28, 1495, entered Capua February 18, and on February 22 he entered the city of Naples. Alfonso II had fled to Sicily before Charles left Rome and had abdicated.



Charles entered the city at the head of his troops beneath a pall of cloth of gold borne by four great Neapolitan lords and says the Italian historian Guicciardini (1483-1540). "He was received with cheers and a joy which it would be vain to attempt a description; the incredible exultation of a crowd of both sexes, of every age, of every condition, of every quality, of every party, as if he had been father and first founder of the city." A French contemporary, Phillip Commynes (1445-1511), Charles' minister, who accompanied the expedition, says: "Never did people show so much affection to King or nation as that shown to the King, they all thinking themselves to be freed of tyranny." The oft-repeated fable of the siege of Naples by Charles VIII might well be omitted from future texts.

Christopher Columbus and his soldiers were not at Naples, and Vasco da Gama did not return from Calicut until 1499, so the women from that place all properly infected, were not there either. Everything was all over by 1496, as we will see when we deal with the anachronisms. Nor were there any Spaniards in Charles' army as Bloch insists that we should believe. More than a month before the French army reached Naples, the envoys of Ferdinand of Spain, Juan de Albion, and Antonio de Fonseca caught up with Charles' army at Velettri, and delivered the ultimatum of their sovereign that Charles abandon his expedition against Naples. This being refused, they publicly tore up the treaty relating to Roussillon, and ordered two Spanish Knights who served in the French army to withdraw under pain of incurring the penalties of treason (Oviedo, *Quincua-genas*; Zurita, *hist. del Rey Hernando*; Bernaldez, *Reyes Catolicos*; Giovio, *Hist. sui Temporis*; Lanuza, *Historias*).

Charles' army did not come in contact with the Spanish forces, to receive an infection from Spain, for he departed from Naples May 20, 1495. The Spanish naval forces under Admiral Requesens did not reach a position off Naples until June 1495, and Gonsalvo de Corboba did not reach the vicinity of Naples with his levies, raised largely from Galicia and Asturias, before July of the following year. Thus, the Spanish forces did not come into contact with Charles and his army, but only with his garrison troops. As for Charles VIII, he found his way back to France blocked at Fornova and fought a battle there and barely escaped. In the meantime the Duke of Orleans was trapped and besieged at Navaro, and Charles was thus delayed so that he was not free to go on his way until October 10, 1495, following the treaty of Vercelli. He did not get over the Alps and reach Grenoble in France until October 27, 1495. In the meantime the well-known blasphemy edict of the Diet at Worms dated a month and 20 days earlier was promulgated showing the disease to be already widespread in Germany. So even assuming that Charles' army carried the infection, they had yet no opportunity to spread it

through contact beyond the bounds of Italy. It is simple if not asinine in these days to consider this disease of epidemic character spread through the air, or by any other means than direct, or almost immediate indirect human contact.

Based upon sleight-of-hand history, reeking in anachronisms, the story of the American origin spread. Boerhaave says:

In Europe this disease first was perceived at Valencia in Spain in 1493, where lived a noble courtesan, as much famed as the ancient Thais. There was in the same city a nobleman belonging to the army, laboring under the worst kind of elephantiasis (described only by Aretaeus Cappadox), who, notwithstanding this disease, by the influence of 50 pistoles purchased one night's favor of this celebrated lady. Gold procured the same favor for others according to the custom of her profession; and afterward having frequent commerce with the young nobles, it is said that in a few days she infected 400 men, most of which were in the army of King Charles, hence the lue venera had a universal spread in a short time.

Thus old lies crushed to earth rise again from the founts of wisdom and teaching.

The greatest and most persistent propagandist of the American origin and the introduction by Christopher Columbus, was the euidite Jean Astruc, who in 1727 wrote a work consisting of nine books on the venereal disease. No work on this subject was republished more times, or attracted greater attention. He states his position clearly in his preface thus:

And its first origin may be traced to the Antilles or Caribee Islands, but especially to the island of Haiti or Hispanola, now called San Domingo, whence it was unluckily imported into Europe. That the Spaniards who arrived there in the years 1492 and 1493 under Christopher Columbus, first contracted the disease by lying with the women of that country, and thence conveyed it to Naples, which they went to relieve ano 1494. That the French, who at that time were at war with the Spaniards and Neapolitans, were soon infected by both; and that from these three principal nations the contagion was soon communicated to the rest of Europe and quickly run over most parts of Asia and Africa.

Thus the story of the Valentian prostitute, that very noble and famous lady, goes into the discard. Astruc knew and presents evidence that the disease was widespread before Columbus returned from his second voyage in 1496. He knew the French and Spaniards were enemies at the time of Charles VIII. Others ought to have known it, too. Then following Astruc lay writers like Voltaire, influenced by such professional opinion, converted this remarkable theory into so-called "history."

#### THE ANACHRONISM, 1493

I propose now to refer briefly to the prevalence of the disease called syphilis during the year of 1493 by contemporaneous writers.

JOANNIS BAPTISTÆ MONTANI *Veronensis*,  
DE  
MORBO GALlico,  
TRACTATUS.

*Ejusdemque de eodem EPISTOLÆ quædam, ex consultationibus Centuriarum Medicinalium ipsius excerptæ.*

*In hoc tractatu  
describitur  
morbis  
quodammodo  
in Gallia  
in Hispania  
plus communis  
morbus.*

**M**

ultiplex est opinio de origine Morbi Gallici. inter reliquas una est, & maxime celebris, quæ talis est, quod morbus iste ab influxu celestis initium, & originem suam traxerit, tamen cessante tali influxu, perseveraverit semper talis aggritudo, quoniam quamplurimi remanserint hujusmodi morbo infecti, qui deinceps aliis, & posteris per contagium ipsum traderint, & ita, ut nunc adeo frequens sit. Verum opinio ista mihi nunquam placuit, tamen in præsentem eam non redarguam, cum huc accesserim docendi magis gratia, quam offendiendi. Quapropter quam brevissime dicam, quid de hac re sentiam. Certum est, quod morbus iste per contagium acquiritur, & non tantum ex congressu mulieris cum viro; verum etiam si quis cum laborante hujusmodi morbo, quique pustulas habuerit, dormierit, eisdemque vestimentis ac rebus, quibus ipse utitur, usus fuerit, facile inficitur. Quis autem ad nos apportaverit pestem hanc, inquiramus. A Christi Nativitate 1492. quidam Columbus miles una cum multis Hispanis accessit in Indias illas novas, quæ Calicut appellatur, qui quidam morbus, quia ibi familiarissimus est, quemadmodum scabies apud nos, accidit tunc, ut multi ex illis Hispanis, dum ibi morarentur, infecti sunt tali morbo, qui deinde ad suas regiones & ad nos revertentes, multos ex nostris infecere. Quod autem iste morbus sit illis Indis familiaris, non est mirum, nam Galen. in *libello illo. an animi mori.* &c. & Hippoc. in *libro de aere, aqua, &c.* & in *primo Epid.* nec non in *primo de ratione Vitis.* inquirunt, quod sunt Endemias quædam, quæ passim vagantur, sicut & Epidemias, quod scilicet hoc sit verum, habetis apud Arabes, quod erat quædam aggritudo, quam venam Endemiam appellabant, quæ talis erat, quod in vena & arteria concreverat sanguis, & videbatur fieri sicut serpens qui-

dam, & difficillime curabatur. sicut etiam de lepra, quæ apud multas regiones frequentissima est, in quibusdam vero raro accidit. Nam Scythæ non patiebantur lepram, & sic paucissimi Germani tali afficiebantur morbo, plurimi tamen Asiatici infestabantur, & hoc propter diversitatem regionum, sicut igitur in illis regionibus nonnullæ aggritudines grassabantur, quæ in aliis non reperiuntur, pariter non est mirum, quod apud Indias illas novas viget morbus iste contagiosus, illis tamen familiarissimus, & ideo repertum est etiam apud ipsos Anticæcum ejus, quod Lignum Guajacacum dicitur. Morbus itaque iste illis est, sicuti apud nos scabies, familiaris, & acquiritur per contagium, sicut & scabies. Cum igitur anno 1498. Columbus ille in Italiam reverteretur, & tum temporis Carolus Gallorum Rex numerofo exercitu Neapolim accessisset, & ique permansisset per aliquot menses, tunc contigit, sicuti in exercitibus evenire solet, quod multi hinc inde fuerint facti transfuge, & sic milites illi Columbi, qui forte etiam ex illis Indis quasdam meretrices adduxerant secum, quibuscumque concumberent, deinde multas alias infecere, quæ deinceps & Italis & Gallis, Hispanisque talem lucem contribuere tunc temporis. Quapropter Galli morbum hanc appellaverunt Neapolitanum morbum, non Gallicum, & hac de etiam ita dicunt. Hispani vero, & Itali Gallicum, quia in eo bello cepit grassari, & hæc de origine istius morbi, & quomodo per contagium acquiritur.

Modo si volumus istius morbi curationem tradere, necessarium est imprimis ipsius naturam & essentiam lavare. At quæ natura est istius morbi, quæve essentia? Dico quod est mala intemperies calida, & sicca in hepate per contagium impressa. Verum quia mala intemperies potest esse cum materia, & sine materia, dico, quod prius hæc intemperies est sine materia, postea procedente tempore fit cum

THE ACCOUNT OF JOHN BAPTIST MONTANUS (C. 1488-1551).

This account brought Columbus and his soldiers back from Calicut to Naples, and invented a seige of Naples by Charles VIII, lasting several months.



Gaspar Torrella, writing 1497, a native of Valencia, but then serving at Rome in the household of Pope Alexander VI and who made the best start in the description of the disease, says that it appeared in France in 1493. In a subsequent edition the place is changed to Alvernia, but the date is unchanged.

Peter Pintor, also a Valencian, and also serving in the household of Pope Alexander VI, writing in 1500, says the disease appeared at Rome March 13, 1493, from the influence of what he calls *radix superior* and *radix inferior* or *caelestis*. This was 2 days before the arrival of Columbus at Palos, and more than a month before the arrival at Barcelona.

Ulrich von Hutten, writing in 1519, says that it appeared at Naples in 1493, and also in France this same year.

In the city of Paris an edict was issued March 25, 1493, or 10 days after the arrival of Columbus at Palos, or a month prior to the arrival at Barcelona. This edict directed all persons with *grosse verole* to leave the city of Paris under penalty of being thrown in the river (*Ordonnances des Rois de France de la troisieme Race*, vol. XX, p. 436). Some writers claim now the disease was not known as *la grosse verole* at this early date, so it is necessary to refer to the Dialogue of Torrella (*Dolore in Pudendagra, Dialogus*). This work was written in France, where Torrella was serving in the suite of Caesar Borgia. In this work he tells us that in Paris and in all the large cities of France the disease is known as *grossa variola* (*Parisiis, and in aliis magnis civitatibus Francoiae, a litteratis grossa variola hic morbus appellatur*, etc.). We have already referred to a work published in Lyons, 1501, giving three remedies for the treatment of *la grosse verole*. Some have referred to the edict as a mere police regulation. It is. That is why it establishes so splendidly the time, the place, and the disease.

Ruiz Diaz de Isla says it was epidemic in Barcelona in 1493, immediately upon the arrival of Columbus. He tells us that in his native town of Baeca cabbages and other garden vegetables contracted the disease. This he explains by saying that the water, in which the clothes of those infected was washed, was sprinkled innocently on garden vegetables, and thus the kitchen herbs became infected. He goes on to say in another place that the women threatened their children and servants 10 years before the disease appeared, presumably in 1483, that they might be cursed with the bubas.

The Genoese historian, J. Baptiste Fulgose, writing in 1509, says the new disease discovered among men and called by different names, according to the country in which it prevailed, was present 2 years before Charles invaded Italy. As this invasion occurred August

1494, this is equivalent to saying the disease was present in 1492, or before the return of Columbus from his first voyage (*biennio antequam Carolus in Italiam veniret, nova aegretudo inter mortales detecta, varie, ut regiones erant, appellata*). The Genoese, Senagera, in his commentaries, 1488–1514, says much the same thing. The Genoese surgeon, John de Vigo, writing 1514, says the disease is commonly known in Genoa by the name *lo mal de le Travelle*, in Tuscany as *lo mal de la Bulle*, and in Lombardy as *lo mal de la Brosule*.

When the book of Leonicensus was first published in June 1497, it appeared with the title: "An account of the Epidemic which is commonly called the Morbus Gallicus" (*Libellus de epidemia, quam vulgo morbum Gallicum vocant*). The book was promptly pirated and published at Milan the summer of the same year with the name *Brosulas* added to the title so the Lombards might know what he was writing about (*Libellus de epidemia, quam Itali morbus Gallicum vocant vulgo brosulæ*).

Kurt Polykarp Sprengle (1766–1833), the great medical historian of the eighteenth century, notes the presence of the disease in 1493 in Lombardy, Mecklenburg, Brunswick, Mark Brandenburg, and Halle (*Essai d'une histoire de la Medec*, Paris, 1810).

Boerhaave and others say it was in Valencia in 1493.

The foregoing indicates that the disease was present in Spain, Italy, Germany, and France in 1493, and further that our present knowledge of the manner of its spread, the time of the incubation stage before the appearance of the chancre, and the further time elapsing before the appearance of its other stages, is incompatible with so rapid and widespread dissemination.

Although Columbus returned from his first voyage this year he was in Europe less than 7 months before starting his second cruise, and by the end of the year was already absent 3 months. How many of the famous 44 survivors accompanied him it would be hard to say, but when one reads of the mad gold rush and the greatly over-crowded ships which sailed away with him, one's imagination grows nauseous and refuses the fable that any of them went to France to join Charles, or to Naples. It should be needless to point out that Columbus and his Indians and companions visited no other countries than Spain and Portugal in the interval between the two cruises. As for Charles VIII, he had not yet invaded Italy, and Corboba was still in Spain.

#### THE YEAR 1494

This year abounds with reference to epidemic prevalence of the disease. Niccolo Leonicensus, writing 1497, attributed the disease

to unusual floods, putrefactive conditions, and pollution of the intemperate air during the summer of 1494. Many other authors for a while adopted his view, and some pointed out that the same intemperate conditions had prevailed before. The account of Schmaus is interesting for the autopsy evidence it mentions.

Corandius Gilinus, also writing 1497, attributes the epidemic to a conjunction of Mars and Jove, occurring November 17, 1494.

James Cataneus, a Genoese, whom Astruc says wrote in 1502, which date is disputed, notes that the epidemic appeared in Italy in 1494, along with the invasion of the army of Charles VIII.

Wendelin Hock, of Brackenuau, who wrote in 1502, identified the disease with the Mentagra of Pliny, ascribing its cause to conjunctions of 1484, and in a later work published under the title of Mentagra, he said the disease had prevailed in epidemic form "from 1494 to the present year 1514" (*Sicut evenit hoc tempore, scilicet ab anno domini 1494, usque ad praesentem annum 1514, quo morbus quidam contagiosus, qui Gallicus appellatur, satis effervuit*).

John de Vigo (1460–1520), of Genoa, writing 1512, identifies the disease with the affliction of Augustus, as described by Seutonius, also with a case described the early part of the century by Hugo Benicus, and says that the present epidemic appeared in Italy in December 1494. Vigo was surgeon to Pope Julius II, and long resided in Rome. Charles VIII arrived at Rome December 31, 1494, on his way to Naples. Could it have been possible that this city was infected in the space of 1 day?

Among other writers that attribute the disease to 1494 are Leonard Schmaus, John Manard, and Gabriel Fallopius. The latter recites many fables as to the origin, but in general the epidemic made its appearance coincident with the abolition of the Order of St. Lazarus. The number of leper houses in Europe, according to Matthew Paris, writing the thirteenth century, amounted to no less than 19,000. What happened when this order was abolished? Fallopius also notes its appearance at the time of the invasion of Charles VIII in 1494, and the return of Columbus this same year (*Columbus rediit in Hispaniam 94 anno*). He is mixed in his dates, for Columbus was still absent on his second voyage in 1494. His book, however, presents much valuable evidence on the then supposed character of the disease.

Anthony Mussa Brasavolus, a student of Leonicensus, says the disease arose in 1494, when King Charles entered Italy. He classifies no less than 223 varieties of the disease, constructing a most remarkable piece of scholastic theorizing, revealing the breach between clinical experience, and tyrannical theories. It also reveals the pitfalls of attempting to fit his disease into our modern conceptions.

John Sylvius and many other latin writers attribute the origin of the disease to the year 1494.

Iwan Bloch notes the new disease (*neue krankheit, nuwer krenkten*), at Niederrhein in 1494, and at "Oldenburg und Ostfriesland" 1494 and 1495.

Astruc makes repeated reference to the presence of the disease in Europe in 1494, in fact he says the Spaniards took the disease to Naples this year, which is a gross anachronism (*Hispanos, qui illuc appulerunt annis 1492 & 1493 duce Christophoro Columbo fœdissimæ cum mulieribus indigenis veneris consuetudine morbum primum contraxisse; contractumque in Neapolitanos traduxisse, quibus suspētiās iwerunt anno 1494*). It ought not to be necessary to point out that neither Charles VIII or any Spanish forces reached Naples by 1494.

Scriphover notes the disease in certain German cities by 1494; namely, Westphalia, whence it spread along the Baltic in Pomerania and Prussia (Lancereaux quotes Scriphover from *Chronica Archicomit Oldenburg*).

Linturius describes the disease at Suabia on the banks of the Rhine, at Franconia and Bavaria (Lancereaux quoting Linturius, *Append. ad facical. tempor*).

We cannot leave this year without noting the indisputable evidence of a widespread epidemic. A critical study of the character will reveal other pestilential conditions than syphilis was included in the descriptions.

The year of 1494 closes with Columbus still absent on his second voyage, with Charles VIII advanced toward Naples as far as Rome, and with De Córdoba and his Spanish forces still in Spain.

#### THE YEAR 1495

Niccolo Scillacio, of Messina, writing from Barcelona June 1495 describes a disease beginning many times on the genitals and accompanied with a severe eruption. He says the physicians of that city informed him that it came out of truculent France. There was no reference to the visit of Columbus to that city or of its rise coincident with his visit, in fact the records of the city as published by Villalba and Morejon show that Barcelona for several years previous to 1493 had hardly been free of pestilence. The city had been busy this year taking back the pawned Province of Roussillon from the French. The physicians, he says, blamed the disease on the French (*Medicos precontanti cum his enim tota illa ferme peregrinatione habui commercia novam istam Luem ex truculenta Gallia affirmarunt defluuisse*). In France continues Scillacio, they commonly call the disease the disease of St. Sementis. "See what good these ominous French are bringing, who abandon themselves



Kolner Originaldruck des Gorneslattereredites Kaiser Maximilians I. von Wormser Reichstag, 7. August 1496.

THE EDICT OF THE DIET AT WORMS. AUGUST 7. 1495.

Graphische und typographische Erstlinge der Sybilla-Literatur aus den Jahren 1495 und 1496, Karl Sudhoff.



to Venus in neighboring regions" (*Vide quid boni afferant portentosae Galliae qua venera affundant in vicinas regiones!*). Sementis, according to Astruc is a contraction of St. Mevis or St. Meen, of the Gallic regions. Hans Widmann, of Tübingen, writing 1497, calls the *morbis gallicus* the disease of St. Mevi or St. Maevi. Sudhoff identifies this saint with the St. Minus of Nürnberg printed prayers. Gaspar Torella, in his *Dialogus*, says:

The Valencians, Catalans, and Aragonese, after long rummaging in books, have called this complaint the disease of St. Semente, because they found in the twelfth chapter of the *Christian Man*, published by the excellent Francesco Ximenes, that a disease of like nature had at other times infected the world \* \* \* and that in fact the disease therein mentioned is frequent and of old date in the Kingdom of France: so that just as the lepers are called lazars by the populace in memory of the sufferings of St. Lazarus, so in like manner the French call the *malum mortum*, the disease of St. Semente, because by his intercession many are cured.

Ruiz Diaz de Isla devotes a section in his book to the *Mal Muerte*, as a manifestation of his serpentine disease. Villalobos likewise describes it as a symptom of his pestiferous bubas. John de Vigo in his book contributes to it a whole chapter. Incidentally it is the chapter on *Malum Mortum* in the *Surgery of Theodoric* (1266), wherein he gives the description of his famous Saracen ointment of mercury, and a chapter on the same condition is in practically every work of the medieval surgeons. It remains to note that Francesco Ximenes was born some time shortly after 1380, and his *Crestia* was printed in 1483, or 10 years before the return of Columbus. The letter of Niccolo Scillacio was printed in his *Opuscula* March 9, 1496. The word "new" inserted by Bloch in front of the word "disease" in his version of the letter (*Der Ursprung der Syphilis*, p. 237) does not appear in the original and has no place in the text.

In Italy we note two physicians who served with the allies at the battle of Fornovo, July 1495, observing the disease among the troops of the allied forces, which opposed Charles VIII at the Taro. These are Alexander Benedictus who wrote his *De Omnibus Morbis*, 1496, and Marcellus Cumanus. Benedictus, being a physician, theorized that a virus was developed from humors, and was exhaled by the genitals of a woman, and produced a general dyscrasia of the body fluids. He also wrote a work on Pestilence in March 1493 in which he mentions the disease *boam* or *boas*, which is the Latin term used for Bubas. The surgeon, Marcellus Cumanus, also served with the Venetian allies. He made many notes in his copy of D'Argelata's *Surgery*, which were published by George Jerome Welsh in 1668 (the same who introduced the work of Ruiz Diaz de Isla into the controversy). This is his fourth observation.

In the year 1496, from a certain heavenly influx falling out in Italy, whilst I was in the camp at Navarre (Navaro) with the Venetian commanders, I

observed many officers as well as foot soldiers in the city of Milan, from a certain ebullition of humors to have several scabs or pustules breaking out upon the face and spreading over the rest of their bodies: The first of which appeared under the foreskin, or on the outside, like a grain of millet. Sometimes behind the glands with a slight itching. At other times a single pustule would arise like a bladder, without much pain, but itching also; if rubbed or scratched there arose an ulcer, corrosive smarting like the sting of a pismire. Few days after they would complain of pains in their arms, thighs, and legs, with large pustules breaking out upon them. All the physicians were under difficulties about the cure. I began the same by opening the saphena and sometimes the basilica, proceeding with digestives and purgatives. At length I used some ointments to the parts that required them, yet still the scabs continued on them, deforming them like lepers, or such as have the smallpox for a year or more without taking any medicine.

All the conditions he described may be found in the works of medieval surgeons. References to smallpox lasting a year or more are not infrequent, in fact the French tract previously mentioned published at Lyons, 1501, contains three remedies for the disease known in the Hebrew as *Mal Franzos*, in French as *la grosse verole*, and in Latin as chronic smallpox (*variola chronique*) is such an example. Numerous other equally illuminating straight-forward observations made by Marcellus Cumanus, referring to venereal disease were entered in various parts of the text of d'Argelata, a brief reference to many of them is made in the work of Ernst Julius Gurlt (*Geschichte der Chirurgie p. 914 et seq.*). These annotations show how the surgeon, Cumanus, identified his observations with the surgical text of d'Argelata, unconfused with the prevailing pestilence.

The Spanish forces raised in Galacia and the Asturias, serving under Gonsalvo de Corboba, arrived off Sicily March 31, 1495. They were still in the south of Italy when the battle of Fornovo was fought, and they did not reach the vicinity of Naples for nearly another year. Thus it should be evident that the disease contracted by the Venetians at Milan could in no way be traced to this Spanish force, the only one in Italy at that time.

Now turning to France, Astruc quotes Jean Bourdigne, writing in 1529 the Chronicals of Anjou, saying that in 1495 the Scabie Neapolitana (*sic.*) was already raging in France.

Frequent references are made to the disease being present in Nürnberg by 1495. Thus Bloch and Fuchs both refer to Frantsozen being introduced this year by the Landsknechten. Bloch and Fuch both quote the Nürnberg Chronical, which, however, is not a contemporaneous record.

Bloch notes its presence in Strassburg in 1495 from Sebastian Frank's Chronical of 1531. Also from the Ausberg Chronical of the same year. He likewise refers to the fact it was brought to

Nördlingen this year (1495) by the *Landsknechte*. These *Landsknechte* were the mercenaries sent to the allies in 1495 by the Emperor Maximilian to expel Charles VIII from Italy. They had abundant opportunity to contract the disease in Lombardy in the same manner as the Venetian troops, with which they were allied. Maximilian had convened the Diet at Worms, March 1495, to raise funds to check the progress of Charles in Italy. This Diet, on August 7, 1495, formulated its famous edict against blasphemy. The *bösen blattern*, or evil pox, as it was called in the vulgate, was at the time raging in various parts of the German Kingdom; and this Diet, taking note of it, with the characteristic type of piety of the time, attributed the disease as God's punishment for the sin of blasphemy prevailing commonly in the market places. These *Landsknechte*, a German term, and often applied to the mercenary soldier of the time, particularly the Swiss, who hired themselves out from various cantons, furnished a word for linguistic juggling. Some persons appear to believe that Spanish "*Landsknechte*" were in Charles' army.

By the end of the year of 1495 Christopher Columbus was still absent from Spain on his second voyage. Charles VIII was safely back in France, and Gonsalvo de Corboba and his forces had not yet reached Naples. Oviedo, who is largely responsible for bringing Corboba into the picture, says: "Many times in Italy I did laugh, hearing the Italians say the French disease, and the French calling it the disease of Naples; and, in truth, both would have hit on the right name had they called it the disease of the Indies." This statement has been printed many times. Oviedo, however, did not go to Italy until after the death of Prince Juan, October 4, 1497, to whose suite he was attached. Therefore those who jump at the conclusion that Oviedo was with Corboba in the first Italian Campaign are in error. Oviedo's statements are at times so loosely made that he has been put in the position of being a careless liar. If, on the other hand, he heard statements in Italy similar to the account of Montanus, who brought Columbus back from Calicut in 1496, and had Charles VIII besieged Naples for the space of several months, no wonder he laughed!

#### THE YEAR 1496

Columbus returned from his second voyage June 11, 1496. Montpensier with the French garrison troops escaped from Naples, and surrendered at Atella July 21, 1496, and Corboba arrived before Atella from the south of Italy about this same time, which was as near as he and his troops had gotten to Naples at this stage of the hostilities.

Corandinus Gilinus noted a conjunction between Saturn and Mars January 16, 1496, one of the causes of the *morbis gallicus*. These had been taking place with some regularity since 1482.

On March 16, 1496, another edict relating to *la grosse verole* was promulgated at Paris. This was a decree of the Paris parliament.

In southern France the disease is reported at Monosque Province and in the city of Puy (Astruc).

In Germany, Bloch notes its presence in 1496 at Niederrhein, where it was called St. Job's disease (Sent Job's krenckde.) at Breslau, at Beyreuth, at Frankfurt am Main, and Vienna. He also notes a hospital for syphilitics (Franzosenhaus) built at Wurzburg, and refers to a note in Chronicon Spanheimense of St. Job's disease prevailing this year (*morbum Job plerique appellaverunt*).

At Nürnberg we find many references, such as the Nürnberger Medicin-algesetze, this edict being published by C. H. Fuchs. Sudhoff publishes 12 entries from Nürnberger Ratskreisen relating to the disease during this year. The earliest date being April 30, 1496, and the latest December 31, 1496. He also notes two prayers published at Nürnberg this year for the use of syphilitics, one addressed to St. Minus, the other to St. Dionysius.

The Baden chronical in Aargau notes in 1496 instructions to persons with *bösen blattern* to stay away from the public baths. An edict of the Council of Zurich this same year forbade persons with *bösen blattern* from frequenting the baths, and the Swiss Congress (Tagstzung) forbade of Cantons (Kantone) permitting those who had *bösen blattern* from frequenting churches, streets, inns, baths, and barber shops.

Now books and regimens began to appear. Early this year Konrad Schellig, of Heidleberg, published the book calling the disease pustulas, or a species of formica. (*In Pustulas, Malas morbum quem Malum de Francia vulgus appellat, quae sunt de genere Formicarum*). He was body physician to Philip Elector to the Palatinate and had accompanied his master to the Diet at Worms in 1495, and the work was drawn up as a regimen at his master's direction. As the title indicates, he identified the disease with conditions long described in medieval surgeries.

August 1, 1496, the Vaticinum, or astrological vision of the Frisian poet-physician, Theodoricus Ulsenius, was printed at Nürnberg, and it contained the now famous print of Albrecht Dürer, the upper part of the print having an astrological diagram enclosing the year 1484, this being the year of the conjunctions commonly ascribed by astrologers as the cause of the disease.

September 1496 a poem was printed at Basel by Sebastian Brant, calling the disease Pestilential Scorra (*De pestilentiali scorra sive mala de Fransos, Eulogium*).

In November and December 1496 two tracts appeared written by a young 27-year-old layman in physic, Jacob Grunpeck, of Burckhausen. The first was published in Augsburg in Latin, in which he also called the disease Pestilential Scorra. The second in the vulgate printed in the same city in December called the disease *Bosen Franzos*. Of the clinical character of the disease he contributed little, but as a pamphlet setting forth its supposed astrologic origin it is one of the most complete if not the best.

In December 1496 was also printed at Venice another poem on the disease, for poets, artists, and astrologers were in the van in describing the disease. This was composed by the Veronese patrician, Giorgio Sommariva. The previous writers were Germans. As Singer and Sudhoff have pointed out, the year to follow marks a distinct cleavage with the past. All previous works that came from the presses were mere reprintings or compilations of the ancients. These books of the next year make the first beginnings of accounts of contemporary experience.

Thus by the close of 1496 the disease was widespread in recognition at least, and knowledge of it, and interest in it, was being broadcast by the now rapidly developing European art of printing, which next after speech itself was a wonderful means of breaking down superstition and spreading learning. The name *morbis gallicus* by which the disease was to be known for two centuries had not yet been introduced by Niccolo Leonicensus. In addition to the names mentioned, the disease was called morphea, pudendagra, mentagra, patsura, gorre, sarna egytica, etc., for syphilis can boast of over 600 synonyms. The book of Niccolo Leonicensus published 1497 was a severe arraignment of the confusion then existing in the subject of dermatology. It consisted of 72 pages, and the first 44 of them are devoted to pointing out the confusion then existing in dermatological nomenclature. It was not the first work to do this, for Lanfrancus had invited attention to this confusion in his chapter on Morphea, and Henry de Mondeville had done much the same thing in his chapter on impetigo. But Leonicensus attacked Avicenna, the Prince of Physicians, who dominated medicine at that time, and he stirred up a hornets' net of disputation which led to a better comprehension of the disease.

The theory of the American origin of syphilis belongs to a bygone age. It was built around a theory of the *alhumeria* by earnest philosophers, who were seeking to break away from the superstitious thralldom of astrology. As knowledge accumulates, such theories, though they often serve a valiant purpose, go into the discard in order to clear the route to further progress. Even in recent time we have seen the theory of the atom, the very foundation of theoretical chemistry, shattered into fragments. Not long ago a student might

go before the faculties, and earn a perfect mark by describing an atom as the smallest particle of matter, incompressible and indestructible. But today, What of this definition? The specters of the electron and proton arise to mock it. Those graphic formula over which we spent so much time appear wabbly. The mystery of the isomer becomes a greater mystery. Only facts can stand the acid test of time. Theories must adjust themselves to facts. Facts cannot safely be distorted in order to adjust them to theories. The theory of the American origin belongs to the traditions of *alhumeria*, but it has no place in a modern conception of pestilence, pests, or contagion, or the disease which we know today as syphilis.

The rambling, if not imbecilic, shifting of dates, of names, of places, of events, of circumstances, and of persons, ought to cast a doubt on the fable of the spread of the epidemic, whatever it was, from Christopher Columbus and his companions of the first voyage. Certainly we can absolve him, in spite of the charge of Oviedo, of any guilt from the second voyage. It is conceivable that one or none of these accounts might be true. All of them could not possibly be true. A study of the work of Celsus could easily clear the mist away. And now, it seems, we should turn our attention to a rational and profitable study of the complex conditions which really constituted the so-called "epidemic" of syphilis which prevailed the latter part of the fifteenth century. I believe, should we break down the barriers and obstacles of the Columbus theory, the astrological theory, the occult essence of the air, we will be in a much better position of viewing syphilis and some other diseases in their true evolutionary perspective.

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#### SHOULD WE STANDARDIZE THE TREATMENT OF EARLY SYPHILIS?

By HAROLD L. JENSEN, Lieutenant Commander, Medical Corps, United States Navy, and  
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The treatment of syphilis is a matter of great importance in the Navy. Whether the incidence is higher than among a comparable group of civilians is not a question to be discussed here, but the nature of our personnel is such that it is certainly of more than passing interest. In the treatment of early syphilis lies the opportunity to prevent a host of later and more serious manifestations. The following statement is taken from reference 3, by J. E. Moore and his collaborators:

\* \* \* the best treatment of paresis, tabes, cardiovascular and visceral syphilis is not the treatment of these conditions but their prevention by means of the treatment of early syphilis. It is hardly too much to say that, given a cooperative patient, the development of late syphilis is the direct responsibility of the physician who treated the patient first.



It is generally conceded that, properly carried out, this first treatment requires a minimum of from 1 to 2 years. Rigid standardization to the point of restricting a medical officer in the use of his professional judgment is, of course, a thing to be avoided and, if each case of early syphilis were treated from start to finish by the same doctor, the question of standardization would seldom arise. However, due to naval transfers, a patient, during the first 2 years of his disease often comes under the care of several doctors and as many plans of treatment which, though equally good, may yield a poor result when mixed.

We begin with the assumption that some reasonable standard should be adopted in the Navy for the treatment of early syphilis and have attempted to make a survey of current, authoritative opinion in order to best determine what that standard should be. Personal letters with questionnaires were sent to a number of well-known syphilologists and a good percentage of answers were received. (See references.) Though the details of the various treatments were often quite different, the authorities nearly always agreed on certain principles. With these principles in mind, we feel that the details should be agreed upon in the Navy in order to make way for organized and intelligent treatment of our cases. Uniformly treated, the number of cases we have in the Navy over a period of years could be of inestimable value in furthering the present-day knowledge of the treatment of syphilis.

However, as important as standardization may be, it should always be flexible enough to allow a medical officer the use of his own judgment in individual circumstances. Standardization cannot be as well applied after the disease has gone beyond the secondary and into the latent or tertiary stage. This paper deals only with early syphilis.

The many types of treatment of syphilis may be classified in four general groups: (1) Continuous, (2) intermittent, (3) intensive, and (4) irregular. Continuous treatment allows no rest periods from beginning to end. Intermittent treatment provides for rest periods at intervals. Intensive treatment is short and concentrated, aiming at radical "cure." Irregular treatment, as implied by the name, is treatment which, for one reason or another, has no plan whatever. Unfortunately, many of our cases come under this classification.

The two general types of medication are the arsenicals and the heavy metals. Of the former, old arsphenamine (606) and neoarsphenamine (914) are the most commonly used. Of the latter, bismuth and mercury are in use either as water soluble, oil soluble, or insoluble intramuscular injections, mercury rubs, soluble intravenous injections of mercury, or preparations taken by mouth. The arsenicals have a definite and powerful spirocheticidal effect. The

heavy metals, while they are weaker spirocheticidals, are believed to act also as "spirochetistics" and to stimulate, or allow production of, the natural resistance of the patient. The usual plans of treatment utilize both, either concurrently or in alternating courses with or without overlapping of these courses. Some plans involve the continuous administration of a heavy metal (usually bismuth) combined with spaced courses of the arsenical (Becker, reference 7).

*Choice of arsenical.*—Old arsphenamine is still the measuring-stick of the arsenicals. With the same dosage and time intervals it will undoubtedly give better results than neoarsphenamine. However, its administration is much more complicated. It requires more time, reagents, and apparatus, and is fraught with more danger. For general use in the Navy, especially outside of naval hospitals, neoarsphenamine is much more practical and convenient, and most authorities concede that it is entirely satisfactory if given in large enough doses over a long enough time and in combination with heavy metals. Stokes prefers 606, "but in prolonged treatment in combination with the heavy metals, 914 gives very satisfactory results" (30). The results of our survey show a 2-to-1 preference for neoarsphenamine. Nearly all of those using it prefer 0.6 gram as the usual dose. However, several well-known authorities insist that if neoarsphenamine, which is weaker than 606, is to be used, it should be given in maximum doses. Moore (3) and his collaborators (except Cole) recommend 0.75 to 0.9 gram. Stokes (1) recommends 0.13 gram per 25 pounds body weight. It is our belief that 0.1 gram per 20 pounds body weight is a satisfactory maximum dose, and that this should be approached gradually during the first two of each series of injections.

*Choice of heavy metal.*—Bismuth was, in our survey, a 28-to-2 favorite over mercury. In the cooperative study of 3,244 cases of early syphilis, reference 2, a superiority of bismuth over mercury was believed to be shown. On page 274 of this reference it was stated as follows:

Comparisons between arsphenamine-mercury and arsphenamine-bismuth treatment disclose the latter as the more effective in ultimate results. Within the first 3 months of treatment the percentage of patients securing Wasserman reversal is practically identical with both bismuth and mercury, whether used with arsphenamine or neoarsphenamine. But with longer treatment (4 to 12 months) there appears to be a distinct advantage for bismuth over mercury, with either arsphenamine or neoarsphenamine \* \* \*.

Another factor in favor of bismuth is that dose for dose it is much less likely to produce toxic reactions than is mercury. Bismuth was first introduced in 1922 and by 1926 had attained extended clinical use. At present it appears to be more popular than mercury. Of the 28 in our series who prefer bismuth, 26 use the insoluble prepara-

tions and bismuth salicylate in oil is by far the favorite. The reasons for preferring the insoluble bismuth were that its absorption is slower and more continuous, that it is less irritating and that it can be given at less frequent intervals.

*Continuous, intermittent, or intensive treatment.*—Intensive treatment, aimed at abortive "cure", is a dream of the past. It is no longer accepted by well informed syphilologists. Although early, complete cure undoubtedly occurs in some cases there is no way to be sure of it at the time, and the risk of the "cure" being more apparent than real is too great.

Practically all of the best known authorities in our group use the continuous method. Rest periods are believed to be productive of relapses, delayed serological responses, Kahn or Wassermann fastness, and other poor results. In the analysis of 3,244 cases, reference 2, some very significant conclusions are drawn, as shown in the following quotations:

Continuous treatment, whether prolonged or brief, and practically regardless of the drugs used, is superior in its results to intermittent. From this study it appears that the proportion of patients whose blood Wassermann reaction fails to become permanently negative during the period of treatment or observation is 6.2 percent under continuous treatment, 17.5 percent under intermittent treatment, and under irregular treatment, 25.3 percent.

This means that almost 3 times as many serum relapses and Wassermann-fast cases occurred under intermittent as under continuous treatment and 4 times as many under irregular treatment. The difference was even more striking with delayed reversals, 4 times (19.8 percent) as many occurring with intermittent and 9 times (43 percent) as many with irregular as with continuous (5 percent). Moore and his collaborators (3) give the following arguments for continuous treatment as opposed to intermittent:

In the majority (of cases), however, biologic cure does not result from a single course of treatment and virulent treponemes remain in various foci in the body. If treatment is begun in the primary or secondary stage of the disease, and the sequence of general tissue reaction, appearance of lesions, and their spontaneous resolution is sharply interrupted, the development of the patient's own resistance against the treponeme is wholly or partially prevented. The patient thus enters on the first rest period without adequate resistance against the living treponemes remaining in his tissues, and must elaborate his immune reactions afresh. \* \* \* he may repeat the process of general dissemination and tissue reaction culminating in delayed or recurrent syphilis, or he may develop that bugbear of early syphilis, a neuro-recurrence.

Stokes (1) says, "At no time in the early months of an active infection \* \* \* should the patient be given a total rest from treatment." Quoting again from the Cooperative Studies (2), "In the vast majority of cases, failure to secure satisfactory serological

results lies at the door of the rest interval of irregular treatment rather than any peculiarity of disease or patient." The above evidence appears sufficiently conclusive to completely condemn intermittent and the rest interval and to establish the value of continuous treatment.

*Alternate or simultaneous medication.*—The discussion on this point is best given in the words of Moore (3):

If arsphenamine and bismuth (or mercury) are used simultaneously, it is obvious that after a certain length of time treatment must temporarily cease and the patient be allowed to rest. There is a limit of tolerance for arsphenamine and mercury past which it is unwise to push even healthy young adults. Furthermore, experimental and clinical evidence suggests that the treponeme may acquire a tolerance for both arsphenamine and mercury, so that after use of either drug a dose originally markedly treponemicidal no longer has any effect. This tolerance is specific for the the individual drug employed and is promptly lost when contact between drug and organism ceases. A first course of arsphenamine alone probably accomplishes as much in the rapidity of healing of lesions, disappearance of organisms, and effect on the blood Wassermann as does the same amount of arsphenamine plus mercury; at least there is no satisfactory concrete evidence of the advantages of combined treatment in these respects. When the first arsphenamine course has been completed and the remaining organisms, if present, have perhaps acquired some degree of arsenic tolerance, it is possible to shift at once to bismuth or mercury. After a few weeks of bismuth or mercury therapy, it may be safely assumed that any arsphenamine tolerance acquired by the organisms in the first course has been lost, and the powerful treponemicidal attack of arsphenamine may again be utilized. This type of continuous treatment with alternating courses of the two groups of drugs may be continued indefinitely without detriment to the patient.

This line of thought appears to be entirely in harmony with statements founds in Stokes' writings.

Stokes, Chambers, O'Leary, Miller, and others recommend that courses of the arsenical and heavy metal overlap each other. In addition to allowing smoother transition from one form of medication to the other and preventing any gap between them, this would, along with increased doses and length of courses, help to increase the value of neoarsphenamine as compared with 606.

Schamberg (27) uses neoarsphenamine and bismuth concurrently, interrupting them periodically with a course of mercury and potassium iodide. This is another method of carrying out the alternating principle.

A suggested modification of the simple alternating, overlapping schedule is the double alternating plan whereby a course of mercury is substituted for every other course of bismuth. This appears to be very reasonable, as it would vary the attack on the disease and also allow a longer time between one bismuth course and the next and between mercury courses, the heavy metals being more slowly eliminated than the arsenicals.

*Duration of treatment.*—In the cooperative clinical studies (2) it was shown that “the good results obtained by prolonging continuous treatment for more than 1 year are more than double those obtained by the same kind of treatment carried through less than a year.” Moore (3) says:

The probability of ultimate cure is in direct proportion to the duration and regularity of treatment. The optimum amount of treatment for early syphilis with the plan advocated (continuous, alternating) is 1 full year of treatment after the blood and spinal fluid have become and remained negative.

Stokes (1) makes the following statement:

I have always insisted on the principle so well supported now by the work of Moore and Kemp, that treatment in early syphilis should be continuous with one drug or another, without even the briefest rest period during the first year or 18 months. Treatment should be continued at least a year beyond the disappearance of all symptoms and signs.

These quotations need no amplification. It is also suggested that treatment should be tapered off at the end, always finishing with bismuth or mercury, never with the arsenical.

*When and how should treatment be started.*—Quoting again from Stokes (1):

If (the syphilitic) infection is not detected until the appearance of the chancre, while we are then several weeks late in preventing generalization, we are still dealing with an untrenched infection. Every hour gained in flooding the system with spirillicides while organisms are still free in the blood stream \* \* \* is precious to the patient. The whole object of this early intense attack is to overwhelm all the organisms, fresh and unaccustomed to their new environment, before they have had a chance to sequester themselves in inaccessible positions \* \* \*.

The cooperative studies (2) showed “a superiority of creative outlook of about one-third when treatment is begun in the seronegative stage.” Moore (3) says that, with a cooperative patient, the curative outlook in seronegative, primary syphilis is 100 percent when the chancre is less than 14 days old, and that, by the time the patient has developed a positive Wassermann, cure is possible under the best treatment in only about 80 percent. Thus a few days’ delay may mean the difference between cure and no cure.

It is by the same reasoning as that of Moore and Stokes, given above, that so many of our best-known syphilologists insist on initial intensification of the first arsenical course, giving the first few injections at closer intervals, in this attempt to drown out the early untrenched infection. We feel that this is of vital importance. It is also important to prolong the first course of arsenicals by 2 or 3 weeks if the serum reaction is still positive.

Although time should be taken, with cases diagnosed by dark field, for a careful physical examination, it appears to us that there is more to be lost than gained by spending 12 to 24 hours for the

usual pre-arsenical preparation (saline cathartic, light supper, no breakfast, etc.) although these precautions can be observed for each injection thereafter. There is never any justification for awaiting the development of a positive Kahn before beginning treatment. However, it is very important that the doctor or pharmacist's mate doing the dark-field examination be able to definitely identify *treponema pallida* and to differentiate them from other spirochetes.

On the other hand, one should be more cautious in beginning treatment of late primary or secondary syphilis in order to avoid the Jarisch-Herxheimer reaction. In the cases where diagnosis is made by the serum reaction and which have not gone beyond the late primary or early secondary stage, it would be wise to begin with about two-tenths of a gram of neoarsphenamine and step it up one-tenth of a gram at each injection until the maximum dose is reached. With a late secondary or a latent case, a month of soluble bismuth should be sufficient before starting the arsenical.

*Blood-Kahns and spinal fluid examinations.*—A case cannot be intelligently handled unless the serological behavior is carefully followed and modifications of treatment made as indicated. Although, in an early primary diagnosed by dark field, one should not wait to find out what the Kahn or Wassermann report shows, he can at least draw the blood and place it in an icebox until the test can be done. To treat a case of syphilis without knowing what the serum reaction was before the first injection and without determining it regularly thereafter is just as blind a procedure as treating a case of pernicious anemia without following the red count. The minimum number of blood-Kahns should be 1 before treatment is begun, 1 or 2 during, and 1 at the end of the first arsenical course, and 1 at the beginning and end of each arsenical course thereafter.

There is no longer any question about the value of routine spinal punctures. Moore (3) recommends that the first examination be done at the end of the second course or arsphenamine (twenty-third week with his plan) and, if negative, at the end of the year's probation following cessation of treatment. Becker (7) does the first spinal at the end of a year's treatment, Schamberg (27) after the first or second year and Stokes coincident with the third arsphenamine injection of the first course. Although there was disagreement on the times for doing them, nearly all agreed that the spinal fluid examination is essential and should be done before discharging the patient from treatment. Moore (3) says, "A physician who dismisses a patient as 'cured' without a routine spinal puncture is criminally negligent." We believe this to be true and therefore recommend a puncture at the end of a patient's probationary period. (See next paragraph.) At least one should have been done previously, either early in the first course (Stokes, Wile, Shaffer),

toward the end of the second arsenical course (Moore, O'Leary, Robinson, Hopkins, Wile), or at the completion of treatment (Becker, Ayres, Chambers, Robinson, Shaffer). There are good reasons for either of the three times. Stokes says that the test, done at the time of the second or third injection warns of the earliest meningeal involvement. Moore says that if the puncture is performed earlier than the end of the second arsenical course (twenty-third week) some abnormal fluids will be overlooked and, if done later, some minor abnormalities will have been cleared up by treatment. On the other hand, the interested physician would also like to know if there is some insidious central nervous system involvement present at the time he allows the patient to stop treatment and go into his probationary period, and even the best of patients cannot be expected to undergo too many spinal punctures.

*Criteria of "cure".*—If a seronegative primary receives 12 to 14 months continuous treatment without serological relapse, or a seropositive receives the same amount after becoming and remaining negative, and if the spinal fluid is negative, it may be considered safe to discontinue treatment and place him on 1 year's probation. During this year he should have Wassermann or Kahn tests at least every other month, preferably monthly, and another spinal puncture at the end of the year. If a complete physical and neurological examination and the serum and spinal fluid are still negative, the patient may be assured with reasonable certainty that he will never develop neurosyphilis, but he should not be discharged from observation. His serum reaction should be tested every 6 months for about 3 years and once a year thereafter for the next 10 or 20 or for life. A yearly physical examination, also, for the next 10 to 20 years would not be amiss.

Some give 1 or 2 years of periodic bismuth courses after completion of the continuous treatment instead of the year of probation without treatment.

*Records.*—While studying health records of syphilitic patients with a view toward ascertaining previous treatment, the writers were impressed with the fact that the present "abstract" is at best inadequate. Eighty of these were chosen at random and in only two cases was it possible to determine the size, time interval, and exact preparation of the drugs used. Of the remainder, one could only guess at the details of treatment, even though knowledge of such details is of paramount importance in the intelligent management of each case.

The Manual of the Medical Department states that the abstract "does not replace any part of the health record or medical history but is in addition thereto." However, we are forced to depend on this abstract for knowledge of previous treatment, rather than any

other part of the health record, because records of treatment are by no means regularly kept on the history sheets and even though they were they would be intermingled chronologically with records of all other illnesses. Also, they are often not easily available because they have been sent to the Bureau.

The dates provided for on the present abstract are inclusive. Sometimes they coincide with the dates of arrival at and detachment from a certain station and sometimes they represent the beginning and end of a course of treatment, whether the injections were given regularly over a short period of time or irregularly over a much longer one. The inclusive dates and arrangement of the sheet make it necessary to represent the individual treatments by means of tallies, or show the total number in roman or arabic numerals. One cannot know the date and size of each treatment. Frequently a number of treatments are shown in both the "arsenicals" and "mercury" columns on the same line with the inclusive dates, and one can only guess whether these were given concurrently or a series of one was followed by a series of the other; and if so, which came first. It is frequently impossible, due to previous, confusing labeling, or no labeling at all, to determine whether the treatments shown are neo or 606 or bismuth or mercury.

In an attempt to remedy these shortcomings, the writers have devised a form which has been in use at the naval hospital, San Diego, Calif., for the past year. It fulfills all the requirements and is easy to interpret. It has been made in such size that it may be incorporated in a health record, and still the printing and spaces for writing are large enough for use with a typewriter or with a pen, if reasonable care is taken and not too blunt a point is used.

The face of the sheet is the same as before, except for a few minor changes. The title should be "Syphilitic Record." If the form is properly kept, it, in fact, becomes a complete record of the case rather than an abstract. The line provided for "luetin" has been eliminated, as it is rarely, if ever, used. Except for this, the same number of lines are given to the "diagnostic evidence" and "description" sections, but these lines are put slightly closer together in order to allow more room for "serum reactions", as this is the space which so often becomes prematurely filled and makes additional, confusing sheets necessary. Twenty-three spaces are provided for Kahns, enough for 18 months' continuous treatment, a year's probation, and 2 more years' observation. We feel that this is a worth-while addition to this side of the sheet.

The back of the sheet is as shown in the illustration below. Although it is primarily designed to fit the ideal treatment of a case, we have found that any form of treatment can be recorded on it. The additional sheets can be practically the same on both sides as



(Insert as last page in health record)

(Date)

\_\_\_\_\_  
(Signature of patient)

**DATE**

## EVIDENCE

Exposed at\_

Primary on

Treponeema

**Blood reaction**

## Secondaries

## Interviews

Signature: \_\_\_\_\_

(Medical officer making diagnosis)

., U.S. Navy.

**WHERE MADE**

**DATE**

**REACTION**

(OVER)

438-1

RECORD OF ANTISYPHILITIC TREATMENT  
(Additional sheet. To start case use form \_\_\_\_.)

(Additional sheet. To start case use form —.)

Name:

Rating (or Rank) -

Page-----  
[FRONT]

(Signature)

Place

(Overlap treatments)  
Shapes of next page

Signature \_\_\_\_\_

**Place**

[OVER]

(Drug, preparation and unit of measurement used.)

## INSTRUCTIONS

Each injection to be recorded in individual space with dose above line and date below line.  
Gross: Time: Gross: Age: Gross: out unused spaces and leave no blanks Use finger-pointed pen and print or write clearly.

--- (Dosing, preparation and unit of measurement used) ---  
Doses above & dates below this line.

**NOTES ON TREATMENT** (Reactions, tolerances, etc.)

(Don't forget to use the measurement of preparation and unit)

**SUGGESTED RECORD OF ANTISYPHILITIC TREATMENT:**

the back of the first, thus eliminating repetition of the data on the face of the first. One of the first and two of the additional sheets would provide space for a complete, individual record of over 2 years' uninterrupted weekly treatments.

We have recorded, on the forms shown below, and according to the principles herein discussed, the ideal treatment of a case of early, primary syphilis in a healthy, young, adult male weighing 150 pounds, who was diagnosed by dark field and showed a negative serology throughout.

#### CONCLUSIONS

1. Our treatment of early syphilis should be standardized, although not too rigidly.

2. Equally good treatments may vary in detail, but this should be agreed upon in the Navy in order to make way for organized, intelligent treatment of our cases.

3. For general use, neoarsphenamine is entirely satisfactory, but the usual maximum dose should be at least one-tenth of a grain per 20 pounds of body weight.

4. Bismuth seems to have a slight superiority over mercury although both may be used very advantageously in the "double alternating" plan.

5. Fifteen to eighteen months of continuous treatment with no rest periods should be given a seronegative primary and the same amount to a seropositive after the serum has become and remained negative.

6. In order to make this possible without over-taxing the patient, the arsenicals and heavy metals should be given in alternate courses rather than concurrently.

7. Overlapping of courses allows for smooth transition from one course to another with no gaps between, and, along with increased doses and length of courses, helps to increase the effectiveness of the neoarsphenamine.

8. Immediate treatment, initially intensified, should be given when the diagnosis is made by positive dark field, thus dealing as severe a blow as possible to the early, untrenched infection.

9. Treatment of late primary, secondary, and latent syphilis should be started more cautiously.

10. The first course of arsenicals should be prolonged 2 or 3 weeks if the Kahn is still positive.

11. Blood for a Kahn (or Wassermann) should be drawn before the first treatment and ice-boxed if it cannot be run at the time. Frequent Kahns are essential to intelligent management of treatment.

12. At least 2 spinal fluid examinations should be made on every case, 1 sometime during, or at the end of, the treatment and 1 after a year's probation.

13. Too definite use of the word "cured" should be avoided, but, in a seronegative primary, or any other case which has had no serological relapses, which has had the suggested amount of treatment and two negative spinal fluids, reasonable assurity can be given the patient that he will have no further trouble.

14. Periodic examinations and blood Kahns for 10 to 20 years, or for life, should be recommended.

15. The records in the Navy of the treatment of syphilis are inadequate.

16. We present a suggested substitute for the present abstract.

#### BIBLIOGRAPHY

- (1) Modern Clinical Syphilology, John H. Stokes (W. B. Saunders, 1928).
- (2) Cooperative Clinical Studies in the Treatment of Syphilis, J. H. Stokes, H. N. Cole, J. E. Moore, P. A. O'Leary, U. J. Wile, T. Clark, T. Parran, Jr., and L. J. Usilton. Venereal Disease Information, vol. XIII, May, June, July, and August 1932.
- (3) The Management of Syphilis in General Practice, J. E. Moore in collaboration with H. N. Cole, J. F. Schambergh, H. C. Solomon, U. J. Wile, and J. H. Stokes. Venereal Disease Information, vol. X, February 1929.
- (4) The Use of Bismuth in the Treatment of Syphilis, H. N. Cole in collaboration with J. E. Moore, P. A. O'Leary, T. Parran, Jr., J. H. Stokes, and U. J. Wile. Venereal Disease Information, vol. XII, April 1931.

Personal communications from the following:

- (5) Alderson, H. E., Stanford University.
- (6) Ayres, S., Jr., College of Medical Evangelists.
- (7) Becker, S. W., University of Chicago.
- (8) Beers, N. T., F. A. C. P., Brooklyn, N.Y.
- (9) Biddle, A. P., Detroit College of Medicine and Surgery.
- (10) Chambers, S. O., College of Medical Evangelists.
- (11) Dennie, C. C., University of Kansas.
- (12) Fox, R. E., Major, Medical Corps, United States Army.
- (13) Goeckerman, W. H., Mayo Clinic.
- (14) Greenbaum, S. S., F.A.C.P., Philadelphia.
- (15) Hedge, H. M., Northwestern University.
- (16) Hollander, L., F.A.C.P., Pittsburgh.
- (17) Hopkins, H. H., Johns Hopkins University.
- (18) Lounsberry, C. R., F.A.C.P., San Diego.
- (19) MacKee, G. M., Columbia University.
- (20) Markley, A. J., University of Colorado.
- (21) Miller, H. E., University of California.
- (22) Moore, J. E., Johns Hopkins University.
- (23) O'Leary, P. A., Mayo Clinic.
- (24) Pudor, G. A., F.A.C.P., Portland, Maine.
- (25) Rich, W. LaF., F.A.C.P., Salt Lake City.
- (26) Robinson, H. M., University of Maryland.
- (27) Schambergh, J. F., University of Pennsylvania.
- (28) Shaffer, L. W., Detroit, Mich.
- (29) Stillians, A. W., Northwestern University.
- (30) Stokes, J. H., University of Pennsylvania (letter containing material from Modern Clinical Syphilology, 1934 edition, not yet released by publisher).

- (31) Tarkington, G. E., Hot Springs National Park, Ark.
- (32) Thornley, J. P., New York, N.Y.
- (33) Way, S. C., Stanford University.
- (34) Wile, U. J., University of Michigan.
- (35) Wollenberg, R. A., Detroit College of Medicine and Surgery.

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**HEMOLYTIC JAUNDICE—REPORT OF TWO UNUSUAL CASES WITH RESULTS  
FOLLOWING SPLENECTOMY\***

By C. W. BRUNSON, Lieutenant Commander, Medical Corps, United States Navy

Hemolytic jaundice, a comparatively rare disease, was first described clinically by Claud Wilson in 1890 and Menkowski in 1900 and the characteristic blood changes were established by Chaufford in 1907, but its cause still remains obscure, although there is some evidence to indicate that a decreased cholesterol content of the blood is associated directly with the casual factor.

The spleen evidently has some influence in the disease, but as suggested by Cushing and Stuart this influence is not paramount. Perhaps as proposed by Weber the assumption is correct that the primary fault lies in the red cells themselves. Mayo and others, however say that "when the spleen is once stimulated to action it develops a pathological condition of its own which is not amenable to corrective treatment, splenectomy under the circumstances removes a rebellious agent, but does not necessarily cure the original disease."

Relapses following splenectomy, as reported by Griffin, Roth, and others, and our two cases would seem to indicate that while in general attacks of hemolysis are in some way connected with the activity of the spleen, the function of destroying red cells in part at least may be taken over by other organs or glands containing reticuloendothelial tissue.

Hemolytic jaundice is characterized by anemia, acholuric icterus, splenomegaly, and increased number of reticulocytes, a lowered resistance of erythrocytes to hemolysis in hypotonic salt solution, and a chronic course with remission and relapses.

There are two forms of the disease: (1) Congenital, hereditary, or familial; and (2) acquired. Laboratory examinations are of great aid in making the diagnosis. These findings are:

1. Low cholesterol content of the blood.
2. Bilirubin of the blood increased.
3. An indirect Van den Bergh test, showing that bilirubin had not passed through the polygonal cells of the liver before being absorbed by the blood and lymph.

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\* From the Medical Service, U.S. Naval Hospital, Brooklyn, N.Y. Read before the Brooklyn Surgical Society and staff of the naval hospital, Brooklyn, N.Y., Apr. 5, 1934.

4. The number of red cells, amount of hemoglobin, and the number of platelets is decreased, but the white blood cells show slight if any variation.

5. The blood picture shows over-activity of the bone marrow.

6. A large percentage of reticulocytes even up to 40 percent.

7. Lessened resistance of the red corpuscles to hypotonic salt solution.

8. Increased urobilin.

9. Microcytosis.

In the congenital form, the icteroid tinge is usually present from birth and there is a history of periodic attacks of abdominal pain accompanied by nausea, vomiting, general weakness, and jaundice. There may also be several others in the family with the disease or showing a tendency to it. In this form the diagnosis is easy, because the characteristic signs and findings are usually present.

With the acquired form this is not so, for many of the features of hemolytic icterus may be absent, notably increased fragility and microcytosis.

There is some doubt whether or not most of the cases reported as acquired hemolytic icterus are not in reality some other disease, for the hemolytic type of jaundice is seen in other diseases and is only one feature in the diagnosis of the entity designated "hemolytic jaundice."

In acquired hemolytic jaundice the onset is usually in early adult life beginning with sudden pain in upper abdomen, nausea, vomiting, general weakness, and jaundice. In some cases the main clinical feature is jaundice, in others the anemia with or without jaundice, and in still others the greatly enlarged spleen may be the outstanding feature.

There is also considerable variation in the laboratory findings; the fragility of the erythrocytes may or may not be increased; the number of reticulocytes is usually increased, but they vary as to whether the patient is in remission or relapse; the spleen is always enlarged but may or may not be palpable. The two cases that we are presenting are of the acquired type; therefore the findings are not typical of what we would expect in the congenital type.

**CASE 1.**—L. K., age 42, Bohemian, married. Admitted February 5, 1932, complaining of weakness, tumor in upper abdomen, and general pruritus.

*Past history.*—Negative except for a crushed fracture of lumbodorsal spine in 1915.

*Family history.*—Negative.

*Present illness.*—Well up to 1922, then he began to suffer from gaseous distention of stomach, belching and sour eructations, but there was no associated pain. These complaints persisted and have gradually become worse. In 1931 he noticed increasing weakness and pallor; following this, he noted a small, firm, nontender mass in left upper abdomen; this mass rapidly increased,

doubling its size in the 4 months prior to admission. He stopped work 4 months before admission because of weakness, consulted a physician, and was told that he had anemia; rest and liver therapy were prescribed. Despite this treatment, he became worse, losing strength and weight rapidly. Appetite was good, but he thought that solid foods made his gastric condition worse. There was no dizziness or pains in the legs. In 1925 he began to have generalized severe pruritus, which persisted and gradually became worse. Warm weather increased the itching.

*Physical examination on admission.*—Skin pale with a yellowish tint. There were maculate, splotchy, fawn-colored, fine, scaly lesions over back, chest, and abdomen. Gait normal. A marked deformity of lumbodorsal spine, the result of an injury.

*Eyes.*—Negative, except that palpebral conjunctivæ very pale and scleræ icteric.

Teeth in good condition.

Tongue pale and on the lateral aspect there was a smooth pink eroded area about 2 cm in circumference.

Chest and lungs negative.

Heart slightly enlarged in transverse diameter. Apex beat in fifth interspace and forceful. Rate 88. Rhythm regular. Sounds weak. A soft systolic murmur heard at apex but did not radiate.

Abdomen protuberant and a firm somewhat irregular tumor mass, about the size of a football extended from under the costal margin in the left upper quadrant down to the crest of the ilium and across the mid line. There was slight tenderness over this mass. The liver was barely palpable under the right costal margin, and some tenderness was elicited in palpating it. Reflexes were hyperactive. Extremities negative. No hemorrhoids.

Admission laboratory examinations gave the following results:

Urinalysis: Negative. No red blood cells.

Red blood cells, 2,100,000; Hb., 43 percent; white blood cells, 7,600; neutrophils, 64 percent; lymphocytes, 34 percent; basophiles, 2 percent; polychromatophilia, 2 plus; anisocytosis, 2 plus; poikilocytosis, 2 plus; nucleated red cells, 4 plus; basic degeneration, 2 plus; reticulocytes, 14 percent; blood type, "O", International.

Volume index, 0.89 percent; saturation index, 1.5 percent; color index, 1.4 percent; Kahn test negative.

Fragility test: Practical hemolysis began at 0.48 percent NaCl Sol., complete hemolysis at 0.35 percent NaCl Sol.

Bence-Jones test: Negative.

Feces negative for occult blood. All tests were repeated several times with approximately the same results. Blood counts were done every few days with only minor changes for the first month, then there was a gradual decrease in the red blood cells and hemoglobin, making it necessary to give him a transfusion of 400 cc whole blood on March 8, 1932. This was followed by a slight improvement in the count up to 2,600,000 with Hb. 55 percent and reticulocytes 16 percent. Although patient had been given liver extract and iron since admission, his condition became worse, his weakness being so marked that he was practically bedridden, only being able to sit up for a very short time. His red blood cells remained around 2,500,000 for a few weeks, then gradually decreased, and on June 20, 1932, the red cell count was found to be 960,000, and another transfusion of 500 cc whole blood was given. There was no reaction, and his red blood cell count increased to 1,600,000. This was followed by transfusions of 250 cc whole blood on June 22, 1932, and like amounts on June 25, 1932, and July 2, 1932. He showed moderate improvement, both in

his blood and general condition, but it was only temporary; in a week his red blood cells began to decrease in number and his weakness to increase. It was then seen that something besides diet, liver therapy, and transfusions was necessary to preserve the patient's life, for his condition was slowly becoming worse in spite of the treatment. So splenectomy, which had been previously considered and rejected because of the great size of the spleen and his general condition, was again considered and operation decided upon, first improving his condition, if possible, by repeated small transfusions. Four transfusions of 300 cc whole blood were given between July 12, 1932, and July 19, 1932, the last one on the morning of operation. With the aid of transfusions his red cell count increased to 3,000,000, with 30 percent Hb., and his general condition was improved. At operation July 19, 1932, through a left rectus incision an enormously enlarged spleen, weight 2,450 grams (see pl. 1), was removed without any difficulty except for its size, as there were no adhesions. There was little blood lost, and patient reacted well. Following the operation his red blood count dropped to 1,920,000, then gradually increased to 3,100,000, 5 days after operation. His convalescence was uneventful. As the red cell count increased the reticulocyte count decreased until it remained well below 4 percent. Ten days after operation, to our surprise, his red cell count began to decrease, although his general condition continued to improve, and on August 6, 1932, about 3 weeks after operation, the red cells were down to 1,360,000, with 35 percent Hb., and reticulocytes 1.3 percent.

A transfusion of 300 cc of whole blood was given, followed by one given on August 9, 1932, and a third of similar amount on August 12, 1932. Following these transfusions his red cell count gradually increased to 3,150,000 with 64 percent Hb., and his general condition continued to improve with increasing strength and weight. From then until October 19, 1932, when he was discharged his red blood count varied from 2,500,000 to 3,000,000 and further transfusions were not necessary. Following the operation patient at once began to gain weight and strength. His jaundice cleared up; pruritus and all symptoms of gastric disturbance ceased. At time of discharge he looked fine and said that he had not felt as well in 10 years. He had been practically bedridden before the operation and now was able to take a moderate amount of exercise each day.

He was readmitted on November 22, 1932, 1 month after his discharge for a follow-up study. He was much stronger and had gained 8 pounds in weight, but had some slight dyspnea on exertion. Physical examination negative except for marked pallor. He remained in hospital for 3 weeks. During that time his red blood cell count varied between 2,000,000 and 2,800,000; Hb., 36 to 59.2 percent; reticulocyte count, 3.5 to 4 percent; icteric index, 5.

Fragility tests: Hemolysis began at 0.5 percent, saline solution completed at 0.24 percent.

A subsequent report from his physician on June 30, 1933, said that although patient appeared in excellent shape his red blood cell count was only 2,000,000 with Hb. 40 percent.

A follow-up letter was sent to him in December 1933. It was answered by a relative, telling us that the patient had another relapse in December 1933 when his blood count dropped considerably. He was transfused several times without any apparent benefit and died a few weeks later. Chart I shows blood findings during his stay in hospital.

The outstanding features in this case were the great duration of the relapses, the severity of the anemia, and the enormous size of the spleen.



This patient was treated with all manner of liver preparation plus iron without any apparent effect, he was given 10 transfusions prior to operation or a total of 3,300 cc of whole blood with only very slight and temporary improvement. Three more transfusions totaling 900 cc of whole blood were given following the operation, and then the improvement was more pronounced and prolonged.

**CASE 11.**—P.D.; age, 38; Jewish; married. Admitted October 17, 1932, complaining of general weakness, nervousness, and jaundice.

**Past history.**—Jaundice in 1921 that persisted for 6 weeks, questionable malaria. Patient was hospitalized three times between 1930 and April 1932; a complete study was made in each hospital. During that time his red cells varied from 1,880,000 to 3,400,000; Hb., 52 and 65 percent; reticulocytes, 9 to 12 percent. Repeated tests for syphilis were negative. Numerous diagnoses were made. The first hospital, chronic cholecystitis and secondary anemia. Second hospital, pernicious anemia and colonic stasis. Third hospital, acquired hemolytic jaundice, secondary anemia, and right direct inguinal hernia.

**Family history.**—Father died, age 50, liver trouble and chronic cough.

**Present illness.**—He was in good health until 1921, then had a severe attack of jaundice, the skin over his entire body became yellow and itched considerably, this lasted about 2 months. From then until 1927 his health was fairly good and he was able to work most of the time, then had another attack of jaundice and severe diarrhea. The diarrhea only lasted 3 or 4 days but the jaundice continued with varying intensity. On admission he complained of occasional severe pains in the right upper quadrant of abdomen, a feeling of general weakness and a poor appetite.

He had lost 15 pounds in weight. His condition had been such that he had been unable to work since 1930. He thought that milk, eggs, and butter had a tendency to aggravate his condition. He had been treated for anemia for the past 2 years. His stools had varied in color, at one time being clay colored for a few days, at other times a blackish green, but no definite blood. Has had some frequency of urination with nocturia three to four times since 1920, and at times his urine has shown visible blood.

Admission physical examination, he appeared anemic and had an icteric tint to skin and scleræ.

Heart was not enlarged; rhythm was regular. Sounds were of good quality. A soft systolic murmur heard best over apex and transmitted to the left axilla. No thrills or friction rubs.

Abdomen: Slight tenderness in right upper quadrant, the liver could not be palpated. There was resistance to palpation making it doubtful as to palpability of spleen but it was enlarged to percussion. An easily reduced right hernia (inguinal) was found. Reflexes, genitalia, and extremities were negative.

Admission laboratory work: Red blood cells, 2,850,000; Hb., 36.5 percent; white blood cells, 5,600; neutrophils, 14 percent; lymphocytes, 78 percent; monocytes, 8 percent; polychromatophilia, 2 plus; anisocytosis, plus; poikilocytosis, 3 plus; reticulocytosis, 6.5 percent; acromia marked; color index, 0.6 percent; volume index, 0.8 percent; saturation index, 0.8 percent; blood-cell volume, 46 percent; fragility test; hemolysis begins at 0.5 percent saline solution; completed at 0.38 percent saline solution. Platelet count, 116,200. Kahn test negative.

Gastric analysis: Total acidity, 33 percent; free Hcl. 22 percent; lactic acid, none. Icteric index, 16.6 percent (Van den Bergh reaction, direct reaction

delayed 7 minutes, quantitative (indirect) less than 0.5 mg, bilirubin per 100 cc blood).

Urine negative for urobilin and urobilinogen. Urine analysis, negative.

The blood examinations were repeated several times with a slight variation of red blood cell count from 2,500,000 to 3,220,000; Hb. 36.5 to 59 percent; reticulocytes, 6.5 to 8.5 percent; and there was some variation in fragility test. In view of our findings and those in other hospitals a diagnosis of hemolytic jaundice was made and a splenectomy decided on. In preparing the patient for operation the first of a proposed series of transfusions was given on November 15, 1932. His blood was type O, international, and his blood cross-agglutinated with the donor perfectly. There was no reaction following the transfusion of 100 cc of whole blood. On November 18, 1932, another transfusion of 300 cc of whole blood was given, the same donor being used. Following this transfusion, patient reported that just prior to his receiving it he had noticed that his urine was black, but subsequent urine had appeared normal. He had a slight fever the night of the second transfusion followed by a severe reaction the next day, with a chill, temperature 104° F., nausea and vomiting. He was again passing black urine and his red-cell count and hemoglobin instead of improving were dropping rapidly.

November 20, 1933, patient's jaundice had increased and the spleen was definitely palpable and tender. All urine passed was very black. Red blood cell count, 1,600,000; Hb., 32.5 percent. It was thought that this hemoglobinuria was in some way connected with the transfusions and patient was questioned closely about the transfusions he had received at another hospital a year previously and obtained the information that he had passed black urine following that transfusion which had lasted for several weeks, but the time relationship was rather indefinite so a check on blood typing and a cross-agglutination was done, but was found to be correct.

Further laboratory study showed the urine to be strongly positive for blood, negative for urobilin and urobilinogen, reticulocytes 10 percent, platelet count, 92,000.

Hemoglobinuria continued but gradually decreased until December 25, 1932, when his urine was clear. Then further effort was made to determine the cause of this marked and prolonged hemoglobinuria, for although it has been noted before in hemolytic jaundice, we were unable to find any reference to its having been such an outstanding and complicating finding.

His blood was repeatedly examined for malaria with negative results. The patient was subjected to chilling and his blood to chilling tests to rule out paroxysmal hemoglobinuria with negative results. Following the cessation of the hemoglobinuria, his condition remained stationary with red blood cell count varying between 2 and 3 millions. Reticulocytes, 8 to 10 percent; white blood cells, 5,000 to 6,000. He was again being prepared for operation, this time without the aid of transfusions, when he began to pass hemoglobinuria on March 24, 1933. His blood count gradually dropped and on April 11, 1933, red blood cell count was 1,740,000 and Hb., 47 percent. Then the color of his urine began to clear and blood count to rise, his urine never became clear, would be black in the morning specimen and grow lighter during the day, but the red cell count had become stationary around 2,100,000. So, it was then decided that the best way to get rid of the hemoglobinuria was by splenectomy, as evidently his cells were being destroyed so fast that the hemoglobin could not be utilized and was being eliminated by his kidneys.

Splenectomy on May 24, 1933: Following the operation there was a drop in the red blood cells to 1,700,000; Hb., 38 percent; and he continued to pass

red to black urine for 6 days when it became clear. His red cell count did not begin to rise until 9 days after operation, when his reticulocytes dropped in percentage.

On June 5, 1933, red blood cells, 2,390,000; reticulocytes, 5.3 percent; white blood cells, 12,300; Hb., 45 percent; blood platelets, 205,000; fragility test: hemolysis begins 0.46 percent sodium chloride solution; hemolysis completed 0.32 percent sodium chloride solution.

June 12, 1933, red blood cells, 2,970,000; Hb., 48 percent; reticulocytes, 1.8 percent; blood platelets, 403,000.

July 5, 1933, red blood cells, 3,510,000; Hb., 64 percent; white blood cells, 5,100; reticulocytes, 3.3 percent. Clot retraction time which had been greatly prolonged prior to operation was now normal.

It should be stated that the patient received treatment constantly before and after operation, for both pernicious and secondary anemia, without any apparent bearing on his condition.

Patient convalesced nicely, with gradually increasing weight and red blood cells until July 19, 1933, approximately 2 months after operation, when he once more began to pass black urine, with some increase in the icteric tint. No cause for this could be found. This ceased after a few days and he felt fine.

Ten days later he was in a fight and suffered contusions on the face about the eyes, and he again began to pass black urine and have increase in icteric tint. This episode lasted about 2 days. Although from the increased jaundice and hemoglobinuria there was evidence of marked destruction of red blood cells, his red cell count was not affected, remaining about 3,500,000 in contrast to its falling to between 1,000,000 and 1,500,000 during such episodes before splenectomy.

The important features of this case were (1) slight jaundice and anemia for several years; (2) severe jaundice and anemia for a year or more; (3) recognizable relapses and remissions; (4) spleen only slightly enlarged but increasing in size and becoming tender during a relapse; (5) an increased fragility of the erythrocytes, that was not constant; (6) an increased reticulated cell count; (7) prolonged hemoglobinuria which undoubtedly was due to the prolonged rapid destruction of red cells during a relapse; (8) two severe and several minor crises associated with hemoglobinuria; (9) an absence of any effect of cold or exposure on the occurrence of the hemoglobinuria; (10) the close association of emotional upsets with the onset of the hemoglobinuria.

Hemoglobinuria in hemolytic jaundice is a very rare condition. In 1923 Giffin reported the first case in this country and abstracted 3 cases from European literature, 1 reported by Bittman in 1900, Chaufford in 1908, and 1 by Berge in 1911, and stated that there had been a few other cases reported but they were not typical of hemolytic jaundice.

In the case reported by Giffin, as well as those of the European literature, the hemoglobinuria was of only a few days duration, at which time there was a rapid fall of erythrocytes with increasing jaundice. None of these cases were operated on.

Our case differs from those reported in that the hemoglobinuria was prolonged, lasting for several weeks on two occasions, also, although at the onset, there was a rapid decrease in erythrocytes, after a level of about 2,000,000 was reached there was only a slight decrease and this rather slowly.

Ordinarily the hemoglobin set free by the destruction of red cells is changed to bilirubin in a normal manner by the liver. During a relapse in hemolytic jaundice the rapid destruction of red cells, with the great amount of hemoglobin can be partially cared for possibly by the endothelial system, but which cannot be properly eliminated by the liver, and icterus results. Now, hemoglobinuria probably means a much greater and more rapid destruction of red cells, the hemoglobin being absorbed by the blood and lymph and eliminated through the kidneys.

In view of the discussion of Gilbert and Lereboullet in 1900 of the possible occurrence of a renal form of simple acholuric icterus, and conclusions of Silvesteri in 1921, that the kidney may secrete substances which have a destructive action on erythrocytes within its vessels. Giffin suggests the possibility of a renal factor in hemoglobinuria in hemolytic jaundice, either as a reduction of the renal threshold for hemoglobin or an actual hemolytic process in the kidney itself.

In the case reported, our attention was called to the close association of emotional upsets and the onset of hemoglobinuria, the first and second emotional upset followed a transfusion, the third the fear of operation, the fourth a fight, and the last one, the information that he was to be discharged from the hospital, which he did not desire. This suggested to us the possibility of a mechanism similar to that in paroxysmal hemoglobinuria, the emotional disturbance in some way precipitating the crisis as chilling does in that disease. There is no way of proving or disproving such a hypothesis now, but in reviewing the previously published case there was also a suggestion of emotional disturbances preceding each crisis.

This case is apparently the first of its kind to be operated on, so there is no way of comparing results, but from our short observation there was without a doubt signs of improvement. Prior to splenectomy the hemoglobinuria would last for several weeks, the jaundice and anemia becoming quite marked and dangerous. Following the operation, although he had two episodes of hemoglobinuria, none lasted more than a day or two, and there was no perceptible drop in red-cell count, although the jaundice became quite marked.

In looking for an explanation of the hemoglobinuria after the spleen had been removed we have to assume that other glands have taken over the function of the spleen, and were destroying red blood

cells faster than the liver was able to take care of the hemoglobin, or that the renal threshold had become so low for hemoglobin that only a slight increase in red blood cell destruction was necessary to cause the hemoglobin to pass through the kidney and into the urine.

The result of operation in these two cases were not as good as we were led to expect from reports, although they were good enough to warrant the operation. In the first case it put a bedridden invalid on his feet and gave him a fairly useful existence for nearly a year and a half. In the second case the relapses were shortened and remissions lengthened, and the severity of the relapse was greatly decreased. The final outcome of this case is not known.

#### SUMMARY

1. Two unusual cases of hemolytic jaundice are presented.
2. Splenectomy does not always cure hemolytic jaundice in its late stage.
3. The incidence of hemoglobinuria in hemolytic jaundice is discussed.
4. The bearing of emotional upsets upon the onset of hemoglobinuria in hemolytic jaundice is suggested.

#### BIBLIOGRAPHY

1. Wilson, C., *Trans. Clin. Soc. Lond.*, 1890, XXIII, 162.
2. Minkowski, O., *Verhandl. Kongr. f. inn. Med.*, 1900, XVIII, 316.
3. Chauffard, A., *Semaine Méd.*, 1907, XXVII; 1908, XXVIII, 48.
4. Cushing, E. H., and Stuart, A. P., *Arch. Surgery*, 12; 539, 1926.
5. Weber, F. P., *Oroc. Roy. Soc. Med.*, 21; *Clin. Sect.* 4, 1927.
6. Mayo, W. J., *Jour. Am. Med. Assoc.*, 83; 815, 1924.
7. Giffin, H. Z., *Surg. Gynec. and Obst.*, 45; 577, 1927.
8. Roth O., *Abstract, Journal Am. Med. Assoc.*, 9; 601, 1928.
9. Giffin, H. Z., *Arch. Int. Med.*, 1923, XXXI, 572.
10. Bettman, *Ueber eine besondere Form des Chronischen Ikterus. München Med. Wehnschr.*, 47; 791, 1900.
11. Chauffard, A., Troisier, J., *Deux Cas d'ictère hemolytique*, *Bull. et mém. Soc. Méd. d. hosp. de. Par.* 2; 411, 1908.

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#### SURGERY OF THE SPLEEN WITH REPORT OF TWO CASES OF HEMOLYTIC JAUNDICE TREATED BY SPLENECTOMY\*

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Following the excellent paper read by my predecessor at this meeting, giving the medical side and a detailed report of the two cases of hemolytic jaundice treated by splenectomy at this hospital,

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\* From the Surgical Service, U.S. Naval Hospital, Brooklyn, N.Y. Read before the Brooklyn Surgical Society and staff of the naval hospital, Brooklyn, Apr. 5, 1934. Followed the preceding article in this number of the Bulletin.

I will limit my own remarks in this brief paper to a general review of this important subject of splenic-connected diseases, with a consideration of the spleen itself, its functions, its relations to other organs, the part it plays in the etiology, the pathology and the diagnosis of certain disease entities, the indications for surgical intervention, its surgical management, and the results expected therefrom.

The spleen, as is well known, is an organ which stands somewhat unique in the various problems associated with its, as yet, unsettled functions and the pathological part it plays in such diseases as hemolytic jaundice, splenic anemia, splenomegaly of unknown origin, pernicious anemia, Gaucher's disease, etc., and the surgeon necessarily occupies a very important position in this field as regards their treatment, and the clarification of these problems, because of the extraordinary results which follow splenectomy in some, and the less positive results this operation offers in other of these disease entities. Therefore, a review of the surgery of the spleen, both as regards the operation itself and the prominent part this surgery plays in the disease related to the spleen as effected by the removal of the organ is in order. Modern surgery of the spleen is practically limited to total removal of the organ. While many operations have been performed in the years past with various and mostly disappointing results, present-day surgery comes to the conclusion that attempts to perform any operation short of complete removal of the organ is inviting disaster, as the ever-present danger of a primary or secondary hemorrhage is too great to ignore.

Older operations, such as splenopexy for the fixing of a wandering spleen have been done, but the results being so frequently unsatisfactory, the operation has been practically abandoned in favor of splenectomy, which has proven by far the safer and better surgical procedure inasmuch as in our present knowledge of the physiology of the organ it has been shown time and again that the spleen is non-essential to the welfare of an adult or even a growing child. The principal reason for this is that the spleen does not function as a single organ, but as part of a system, viz, the reticulo endothelial system. Splenotomy has been, and still is, occasionally performed in recognized accessible abscesses, or cysts, but even in these cases splenectomy is preferable unless there is some definite contradiction for the operation, as it avoids the tedious, protracted, and often doubtful convalescence that follows splenotomy. In cases of rupture, lacerations, or perforations, the surgeon is to be the best judge in rendering the decision as to the proper course to pursue, but even in these cases, the removal of the organ may be an infinitely better and safer procedure than attempts at its repair with its attendant

complications of hemorrhage, infection, and doubtful results. Even during the World War (1) surgeons confronted with cases of gross injuries to the spleen often decided in favor of splenectomy whenever there existed in their minds any doubt as to the expected results from attempts at repair with their possible infections and often fatal secondary hemorrhages. There have been cases also in which the spleen has been removed when accidentally injured or its blood supply interfered with during other major surgical procedures, such as operations on the pancreas or gastric resections.

The introduction of splenectomy as a safe surgical procedure is of recent origin, but history shows that as early as 1578 Baillon reported a successful removal, and again in 1581 Vicard (2) reported a similar case. The first experimental splenectomy was reported by Clark in 1676; however, it was not until 1826, or 150 years after Clark, that a splenectomy performed for splenomegaly was reported by Rostack (2). Then came disputed controversies among the surgeons of the middle nineteenth century as to whether splenectomy was a justifiable procedure and it was not until 1882 that a collection of 29 cases of splenectomies was reported. In 1898 Vanwerts collected a series of 274 operations with 170 odd recoveries, and by 1908 a total of 708 cases were collected and reported by G. B. Johnson (3). That the operation now stands on a firm surgical basis with definite indications and constantly improving results needs hardly be commented upon, as recent statistics to prove the contention are available on every side.

While we all admit that many recent experimental clinical studies have greatly enhanced our knowledge of the physiology and pathology of the spleen, there are yet many disease entities in which splenomegaly is a symptom but in which we do not know the relation that this enlargement bears to the gross pathology present, and even in the many reported cases in which splenectomy has improved or actually cured the condition for which the operation was performed, we are yet at a loss to know the reason of such an improvement or cure. It is a fact, however, that in all the diseases in which splenectomy is indicated and in which this operation is followed by curative effects or by inducing a favorable influence on the course of the disease, splenomegaly to a greater or lesser extent exists. This does not mean, however, that a splenectomy would be beneficial in all cases in which splenic enlargement is a factor, as there are many conditions in which an enlargement of the spleen is recognizable and yet splenectomy is not indicated; therefore a thorough understanding of the surgical indications and contraindications in a given case of splenomegaly are essential if we are to lead up to happy and life-saving results whenever we are called in to render a decision. While it is now quite well established

that certain diseases, such as hemolytic jaundice, splenic anemia, Banti's disease, hemorrhagic purpura, etc., are cured or benefited by splenectomy, many factors must guide the surgeon in his decision to operate, principal among which are the stage of the disease; the age of the patient; the family and personal history; the Kahn test; the blood picture; the resistance of the erythrocytes; the depth; extent and duration of the jaundice; and the general condition of the patient—all these factors are essential to guide us not only in rendering a decision to intervene surgically, but also in the establishment of the proper diagnosis, and it is, therefore, of paramount importance that the surgeon work hand in glove with the internist in a careful study of the patient, his clinical history and course of the disease, in order to arrive at the conclusion that splenectomy would actually cure or benefit the patient; preparing him for the surgical procedure by blood transfusion and other remedies, such as was successfully done in the two cases presented here tonight, for, after all, unless a patient is so prepared, a brilliantly performed operation may go to naught, if the strength and resistance of the patient will not withstand the shock of the operation itself.

In arriving at a diagnosis, of course, the danger of mistaking neoplasms in the upper left quadrant for enlargements of the spleen must be recognized. Tumors of the left kidney, carcinoma of the stomach, ovarian cysts, pancreatic cysts, omental malignancy, etc., all may lead to a possible error, and differentiation must be carefully made. Roentgenology comes in to aid us in this respect, particularly in the use of pyelography to eliminate the kidney as a possible source of error. In speaking of the X-ray, we must not pass over the recent advances made in the study of the reticulo-endothelial organs, as the liver and spleen, by means of thorotrast without comment.

I will omit the technical details of the action of the alpha, beta, and gamma rays on tissues with this substance injected into it, except to say that the alpha rays produced by the radioactivity of this metal may become quite dangerous but will show briefly the pros and cons of the present status of the usage of this drug. Many believe that the metal thorotrast, or thorium dioxide, causes serious damage to the reticulo-endothelial system. Stewart, Einhorn, and Illick (4), after considerable investigation, found that while the use of the drug is valuable in rendering the liver and spleen radiographically visible, they met with some unpleasant reactions and were doubtful if the knowledge obtained justified its general use. Others claim that the action of this metal on the reticulo-endothelial cells reduces the resisting powers of the system against infection. The thorium blockades the reticulo-endothelial system, hence the phagocytic power of these cells in protecting the system is seriously interfered with, particularly as the drug is very slow in being



eliminated, and, of course, there are some observers who claim that the presence of the metal has no appreciable effect upon the resistance of the body to infection nor upon the organs themselves.

The fact remains, however, that at least a percentage of the cells of the reticulo-endothelial system, whose function it is to protect the body against infections, receive the thorium, are ingested with it, and therefore their function as protectors of the body against infection is interfered with—true that perhaps only a small percentage of these cells may be so involved, but in this connection we must not lose sight of the fact that the number of cells involved depends a great deal upon the individual idiosyncrasy of the patient to the drug, and since the procedure is still in its infancy, we should not at this time take this method of diagnostic aid too seriously, particularly in cases in which liver disease is present, as present it is, in hemolytic jaundice in the form of atrophy, and in the late stages of Banti's disease in the form of cirrhosis. In these two diseases at least some of the liver cells are damaged, and if we add the possible damage the thorium produces, even though small, it is reasonable to believe that we would certainly decrease the patient's chances to fight the infection.

In fact, there is at least one case of splenomegaly on record, reported by Buengeler and Krautwig, in which the spleen ruptured following the injection of the thorium dioxide solution (5). Considering, therefore, the advantages and disadvantages of the use of this metal for diagnostic purposes, we must conclude that while hepatosplenography may aid in the diagnosis of a doubtful mass in the abdomen, its probable damage to the liver and spleen cells renders its use inadvisable, particularly since splenic enlargements are usually readily demonstrated clinically—the consensus of opinion so far, is that the use of the drug is dangerous and should be used only in very few selected cases, such as cases of gastrointestinal malignancy, where it would demonstrate metastasis in liver and spleen and thus obviate the necessity of needless surgery such as massive resections of stomach or colon, etc.

As it is at present administered, a 25-percent suspension of thorium dioxide is diluted 1 to 10 in 5-percent dextrose. Amounts up to 0.8 cc of this solution per kilogram of body weight is injected slowly into the circulation through a vein, given in 2 or 3 doses 24 hours apart, and X-ray plates made on the third or fourth day. The thorium is deposited in the cells of the liver and spleen, thus rendering them opaque to the X-ray. Elimination of the drug is extremely slow, remaining in the tissues for several years. Experimentation on dogs (6) injected with thorium has proven that 2 years following the injection not only the cells of the liver and spleen were found to contain thorium but lymphatic vessels and lymph follicles were

found to contain the metal, showing that with the lapse of time the metal finds its way to the lymph nodes with the possible risk of late injury to the lymphatic tissues in general.

A few words also as to the value of some of the more recent tests for ascertaining the functional power of the organs of the reticulo-endothelial system. The galactose tolerance test designed as a valuable aid in determining to what extent the function of the liver is impaired, is of particular value in cases of jaundice in differentiating between the intrahepatic type encountered in hemolytic jaundice and Banti's disease, and the obstructive type as occurs in obstruction of the common duct; and also in cases of Banti's disease, to ascertain if and to what extent liver damage is present.

It has been repeatedly proven that the liver possesses remarkable reserve functional power and remarkable ability to regenerate damaged cells. Experimentation on animals (7) has shown that over 60 percent of the liver substance can be excised with not only the survival of the animal but the regeneration of the liver bulk to normal or near normal amount in a few weeks time. Considering that the human liver possesses similar faculties, the ordinary liver function test, such as the bromosulphthalein, would, therefore, not necessarily reveal the extent of liver damage when the tests show that the liver is functioning. In other words, if only three-fourths of the liver were functioning the test would still show a comparatively normally functioning liver. The galactose test, however, has been introduced to show a dysfunction even when a comparatively small portion of the liver substance is involved in a diseased process; therefore, it is of inestimable value where a differential diagnosis is desired in cases of jaundice and in cases in which liver damage exists. Briefly, the test is conducted on the principle that galactose is readily absorbed in the gastrointestinal tract, but is with difficulty converted into glycogen by the liver. With a normal liver, only 0 to 3 g of galactose are excreted through the urine within a period of 5 hours, following the ingestion of 40 g of the drug. This amount of galactose, i.e., 3 g or less excreted in 5 hours, is set down as normal; or, in other words, a healthy normally functioning liver is able to convert 37 or more grams of the galactose into glycogen; therefore, when the amount of galactose excreted in 5 hours is in excess of 3 g it indicates liver damage, in direct proportion, of course, to the amount in excess of 3 g, i.e., the greater the amount of galactose excreted the greater the amount of liver damage.

Another test to differentiate a jaundice due to common duct obstruction from that occurring in hemolytic icterus is in the absence of urobilin in the urine after repeated examinations from cases of obstructive jaundice.

Now, before proceeding to the indications and contraindications for splenectomy, let us pause for a moment to look into the functions or supposed functional properties of the spleen. There is but little known concerning the true function or physiology of this organ. Experimental work has been published (8) which proves that splenectomized animals have been able to develop greater speed while deprivation of their spleens caused no apparent injury, but their observation has failed to throw any light on the functions of this organ. As we all know, the giraffe is probably the only animal known that is spleenless by nature and is as active and healthy an animal as any of its confreres.

It has been proven that in prenatal life the spleen possesses active hematopoietic tissues and therefore active blood-forming functions, but at the time of birth it becomes much less active in this field, the blood-forming function being taken up by the bone marrow in a large measure, while the spleen retains the function to a much lesser extent, it being limited principally to the formation of leukocytes. As a part of the reticulo endothelial system it is, of course, an important organ of red cell destruction, the destroyed red cells forming the basis of bilirubin formation. Through the action of a hormone the spleen also exercises a marked restraining influence on the activities of the bone marrow.

The exhaustive works of Barcroft and Binet in 1925 (9) brought them to the conclusion that the spleen's chief function is to store quantities of blood for use in occasions of emergency—this phenomenon has been demonstrated by the contractility of the organ following a hemorrhage, the shrinkage in the size of the spleen has been estimated to account for nearly one-third of the total blood volume. This same idea of storage of blood in the spleen may well explain the fact that infectious agents such as protozoa that have once attacked the system may be stored in the spleen and there remain as a future focus of reinfection. This phenomenon explains to a great extent the recurrence of attacks of malaria after long periods of quiescence, and statistics of malaria show an abundant number of cases that remained free of further attacks following splenectomy.

The properties of destroying blood cells which is attributed to the spleen and which is accepted everywhere, can, and does, also explain how in certain diseases, such as splenic anemia, hemolytic jaundice and purpura hemorrhagica, the blood cells themselves may have been at fault from the start of the disease, but even as such could still function to fulfill the needs of the body, but the spleen possessing the special affinity to destroy partly formed or faulty cells, destroys these cells in large quantities and in this way seriously menaces the patient's life, and it is upon this theory that the therapy

of administering blood-forming remedies, such as liver extracts and addisin in the form of concentrated hog gastric juice, to cases of anemia is based, i.e., these substances stimulate the bone marrow to manufacture more mature cells and megaloblasts, and so prevent their destruction by the spleen which they reach in a more normal form.

Let us pass over the various indications and contra-indications for splenectomy briefly, and then apply ourselves directly to the treatment of the disease entities in which the removal of the spleen is no longer a matter of conjecture, but an established surgical procedure. Besides the conditions mentioned earlier in this paper in which splenectomy may become imperative; viz, wounds, rupture, movable spleen, abscess, cysts, tumors, etc., the operation has also occasionally been undertaken in such conditions as splenomegalies, due to malarial infection, syphilis and tuberculosis and certain cases of pernicious anemia and leukemia, in addition to the three well-known entities in which the best results have been obtained, viz, hemolytic jaundice, purpura hemorrhagica, and Banti's disease.

In syphilitic splenomegaly, splenectomy often produces encouraging results. The patients respond to antisyphilitic treatment much faster and much more satisfactorily. In the Mayo Clinic the patients splenectomized for this affection made remarkable response to antiluetic treatment as compared to their response to the same treatment prior to operation, and, conditions like syphilitic cirrhosis disappeared promptly.

In tubercular splenomegaly—removal of the spleen is problematical as to results. If it can be ascertained that the disease began in the spleen and is limited to the spleen itself, beneficial results may be expected from splenectomy.

Gaucher's disease, which is a very chronic disease—often of 20 years' duration—begins usually in childhood and is characterized principally by splenomegaly with endothelial proliferation in liver, lymph glands, and bone marrow, besides the spleen. There is no jaundice. It is a disturbance in the lipoid metabolism and statistics of splenectomies performed for this entity are rather discouraging, inasmuch as the involvement of the liver and skeletal system with hemorrhagic diathesis make it obvious that the removal of one focus of the disease cannot be expected to cure it. Splenectomies in this disease, however, have been performed and still will be, when they are indicated as life-saving remedies, such as in severe hemorrhages and profound anemias. Giffin reports 6 cases with 3 deaths and of the 3 successful cases, 2 are living and well and 1 is unheard from (10). It is, however, in splenic anemia or Banti's disease, in purpura hemorrhagica and in hemolytic jaundice that the removal of the spleen has had its most brilliant results, and it is these three

entities, particularly hemolytic jaundice, that we will take up more or less in detail.

*Splenic anemia.*—In the first place, the term “splenic anemia” as applied to a condition which in its later stage is called “Banti’s disease”, is somewhat of a misnomer, for the simple reason that there are many types of splenic anemias; i.e., in the many conditions in which splenomegaly is a prominent feature, anemia is bound to exist to a greater or lesser degree; therefore, truly speaking, a splenic anemia exists in many conditions in which splenomegaly and anemia coexist. However, splenic anemia as at present recognized, presents in its early stages a splenomegaly and a leukopenic anemia of secondary type; i.e., faulty blood formation plus a leukopenia; later in its progress in addition to the aggravation of these two signs, the liver becomes cirrhotic with its chain of symptoms, principal among which are ascites and gastrointestinal hemorrhages.

It is at this later stage of the disease that Banti’s name became associated with it, since he was the first to describe it in 1894. The etiology has always been obscure, and it is still a matter of mystery, so much so that W. J. Mayo once said in this regard that “Incomplete knowledge is essential to the diagnosis.”

The symptoms of the condition naturally are divided into those of the acute stage and those of the chronic stage. The acute stage manifests itself early, and the usual symptoms consist of pallor, loss of weight, weakness, and some pain in the extremities. Splenomegaly is present but probably not recognized. This stage may last 6 months to several years, but it is not until the chronic stage sets in that patients usually seek the advice of physicians. In this stage the principal manifestation in addition to those of the acute stage are hemorrhages from the gastrointestinal tract, an enlargement of the liver with or without ascites, and an ever-increasing splenomegaly. As to the blood picture, the erythrocytes average about 2,500,000 to 3,500,000; hemoglobin is usually under 50, and the white cells rarely exceed 4,500.

Splenectomy in this disease has proven to be of unquestionable value when performed early in its progress; the earlier the operation the better the results. Early diagnosis should not be difficult if one recognizes the splenic enlargement, plus the characteristic blood picture. Prior to the involvement of the liver and the occurrence of the gastrointestinal hemorrhages, splenectomy cannot only be performed with less risk, but the chances of the patient to be benefited or cured are high—the statistics (of which there are many), amply prove that restoration of the blood picture to normal and a favorable progress of the case for many years usually follows the removal of the spleen. Later in the progress of the disease, however, when hepatic cirrhosis, ascites, and gastrointestinal hemorrhages have mani-

fested themselves, the risk of a splenectomy is materially increased, the operation is often quite difficult owing to massive adhesions between the spleen and surrounding tissues, the pedicle is often friable and liable to tear easily, but even at this advanced stage, an exploratory should be done with a splenectomy in view, and if the spleen is fairly free of mechanical interference, and the operation not impossible owing to firm and general adhesions, the spleen should be removed, as while the operative mortality at this advanced stage of the disease is perceptibly higher than it is at the earlier stages, viz, 10 percent as compared to about 6 percent, the results obtained have been very gratifying indeed. The mortality without operation is invariably 100 percent. Omentopexy may be added to splenectomy in cases in which ascites is a very prominent symptom.

*Purpura hemorrhagica.*—*Purpura hemorrhagica*, or thrombo-cytopenic purpura, usually occurs in children, but adults are also attacked. Its principal characteristics aside from the absence of fever or toxic symptoms are (a) hemorrhages from the skin or mucous membrane which may occur at any time in the progress of the disease and may assume such serious proportions as to menace the patient's life. The hemorrhages are the real cause of the anemia which is present in many cases. (b) The presence of petechiae which may appear suddenly are due principally to a marked weakness of the capillary vessel walls, demonstrated by the occurrence of the petechial hemorrhages distal to a tourniquet applied lightly or just enough around the upper arm to obstruct venous return. (c) The blood picture is one of diminished, or absence of, blood platelets, prolonged bleeding time, with normal coagulation time, and, retardation or failure of the clot to retract. The lack of sufficient platelets is undoubtedly responsible for the increased bleeding time and contributes largely to the occurrence of the hemorrhages, which invariably occur when platelets fall below 30,000.

In this disease splenectomy has proven of great value—its benefits being derived from the removal of an organ which is, in all probability, the etiologic factor in the causation of the disease and also to the remarkable early reappearance of the platelets in the blood stream to protect against further hemorrhages.

The operation is usually simple as the spleen, as a rule, does not reach the enormous size it attains in other diseases; the splenectomy, however, should not be done during the acute stage of the disease, when blood transfusion in small quantity often repeated, should be given, preparatory to operation at a later stage.

*Hemolytic jaundice.*—It is in hemolytic jaundice that splenectomy has its most effective results. As my predecessor has so clearly pointed out in his paper, hemolytic jaundice is primarily divided into the congenital and acquired varieties. From a purely clinical

standpoint, the principal distinction or difference between the two forms is the degree or severity of the symptoms, the acquired form being the more severe of the two. The typical case is characterized by jaundice, chronic in its course and acholuric in type; i.e., while bile is constantly present in the blood, due to the severe destruction of red cells, it is absent from the urine, except in rare instances during the occurrences of crises to which the disease is subject. Therefore, this type of jaundice is differentiated from the chronic prolonged jaundice, due to obstruction of the common bile duct with its chain of symptoms such as clay stools, pruritus of skin, petechiae, and absence of urobilin in the urine.

The splenomegaly is the chief differential point; it is present even in the mildest form of hemolytic jaundice either of the congenital or acquired type.

Then comes the blood picture with its characteristic fragility of erythrocytes and pronounced increase in reticulated cells, but I will not go into this part in detail as it has been so well shown by the previous paper. The occurrence of the crises is a very important syndrome coming on at irregular intervals and during which the jaundice deepens, and the splenic size increases, besides the many other characteristic signs, such as pyrexia, headache, rapid pulse and general malaise, the patient appearing very toxic. While these signs all contribute to the differential diagnosis, the main problem which confronts us, is the constant increasing fragility of the red cells.

While the indications for splenectomy are clear cut in the well-established cases with definite crises, it should be performed also in milder cases of the disease, cases in which even though crises have not occurred, the enlargement of the spleen and the presence of the hemolysis are sufficient signs to warrant the operation. As a matter of fact, the decisive factor for splenectomy in any given case of hemolytic jaundice should be the increasing fragility of the erythrocytes which is also the most useful single item in arriving at its diagnosis.

The spectacular results obtained in the amelioration of all symptoms and the possible cure following splenectomy in these cases is well known.

There is no doubt but that in our own cases, the operation itself would have been simpler and the results more brilliant and lasting had the patients applied for their treatment months or years before. As to the operation itself, the technique is quite simple in cases where no abnormal adhesions exist, even though the spleen may be several times its normal size. Many incisions have been advocated, the median, the modified median of Bevan, the chondroplastic resection of costal arch as advocated by H. M. Meyer, etc. However, we have found that the left rectus incision with splitting of the muscle will

give ample room as the incision can easily and quickly be enlarged above and below.

The enormous spleen removed in case I of our two cases, weighing 2,450 grams (5.5 pounds) and measuring 10½ inches in length by 7 inches in width, was removed easily through this incision. There were no adhesions, the spleen occupied practically the entire left hypocondrium, being fully the size of a football, and it slowly but easily shelled out of the abdominal cavity after slowly separating the gastrosplenic ligament and carefully ligating the vasa brevia which are found in this ligament; the reflexions of the peritoneum that unite the spleen with the kidney and diaphragm were easily disposed of by blunt dissection with a finger. The size of the pedicle was increased in proportion to the size of the spleen, the vessels being enormously enlarged, the splenic artery being approximately 1 inch in diameter. After carefully separating the tail of the pancreas from the pedicle by blunt dissection as far as convenient for the placing of the ligatures, two large clamps were applied on the proximal side of the pedicle and one to the distal side close to the spleen. The pedicle was then cut close to the splenic clamp, and the spleen removed, leaving the pedicle caught by two clamps. The proximal of these two clamps was then removed and a ligature placed around the entire pedicle in the groove left by the clamp and tied securely while the last clamp was still in place. The last clamp was then slowly loosened and removed, then the remaining pedicle was transfixed and two more ligatures placed distal to the first, the general toilet of the peritoneum attended to and the abdomen was closed without drainage. Palpation of the liver during the operation revealed no apparent abnormalities.

The patient made an uneventful recovery from the operation, the subsequent behavior of the blood picture and general condition of the patient having been given by the previous paper.

In the second case the operation was also easily accomplished. The spleen, while not as large as that of the first case, was considerably enlarged, weight 460 grams. It was found free of adhesions and easily removed in the same manner as in the first case. The pedicle was ligated en masse by three rows of ligatures, the last of which by transfixion of the pedicle. Abdomen closed without drainage. Patient made an uneventful recovery, his subsequent condition and blood findings having also been described by the previous paper.

As to the slight recurrences of hemoglobinuria after the removal of the spleen in this case, Dr. Brunson has brought out very clearly the probable reasons for the re-currence of the hemoglobinuria, and I believe that his conclusion that the reticulo-endothelial system had taken up to some extent the destructive function of the now



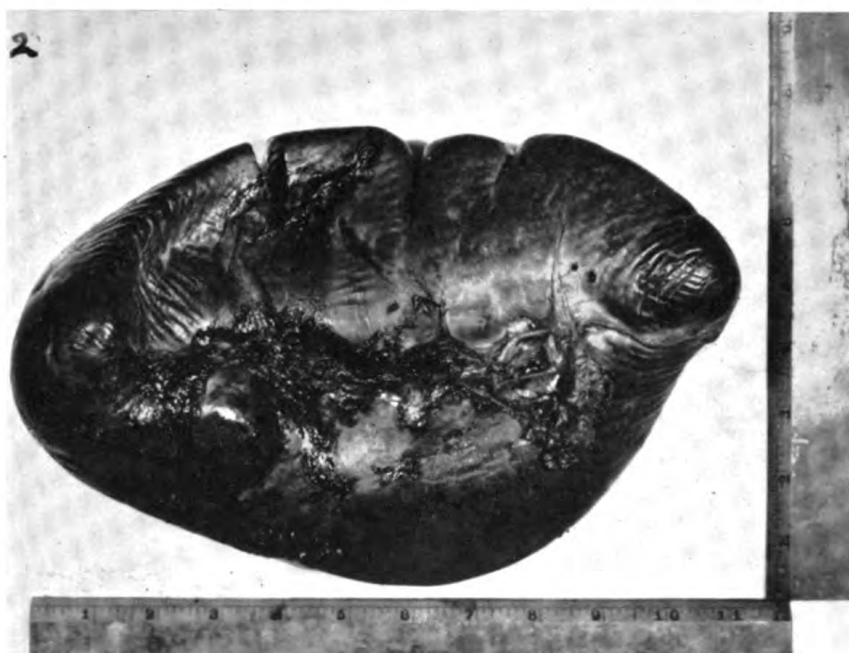


PLATE 1.—SPLEEN REMOVED AT OPERATION ON CASE I WEIGHED 2,450 GRAMS.

DATE	RED CELL COUNT	HEM G	HT %	H.B.C.	DIFFERENTIAL	TOXIC INDEX	WBC COUNT	PLATELETS
2-6-32	2,400,000	45	14	7,600				
2-26-32	2,900,000	52	14	11,200	0.45-0.35			
3-2-32	2,000,000	40	10	6,000				
3-11-32	2,000,000	50	10	7,800			2-10-50-100	100,000
3-21-32	2,000,000	50	14	6,000	0.30-0.20	10		
3-29-32	2,400,000	50	12	11,600				
4-15-32	2,400,000	50	10	4,200				
4-20-32	1,800,000	40	14	2,800				
5-6-32	1,800,000	40	35	15,000			7-11-20-500	
5-15-32	2,400,000	55	22	6,400			6-20-10-500	
5-23-32	1,800,000	30	12	2,000			6-27-11-500	
6-8-32	1,850,000	41	1.5	10,400			6-28-10-500	
7-5-32	1,100,000	30	1.1		0.44-0.74		7-11-10-500	
7-19-32	1,220,000	33	3	2,000	(CALCULATED)		7-19-10-500	
7-26-32	2,000,000	60		2,350				
7-29-32	2,710,000	42						444,000
8-3-32	1,000,000	45	2.1	2,000			6-1-22-500	
8-10-32	2,400,000	47	2.1	6,200			8-2-22-500	
8-12-32	2,840,000	55	22	2,800			8-12-22-500	220,000
8-17-32	2,150,000	64	1	2,800				312,000
8-22-32	2,100,000	11.2	3	10,400				220,000
9-12-32	2,000,000	11.2	3.0			4.3		
9-24-32	2,520,000	53	1.2	2,100	0.20-0.30			
10-6-32	2,480,000	45.5		2,000				
11-21-32	2,000,000	52	3.5	2,000	0.20-0.20	5		
12-9-32	2,800,000	41	4	6,050				202,000

FIGURE 1.—CASE I L.K.  
Blood findings during hospitalization.



absent spleen, upon the red cells to such an extent that the liver was unable to care for the superfluous amount of hemoglobin liberated by such destructive process, and, therefore, its absorption by the circulation caused its excretion through the kidney. That the spleen had been the primary cause of the condition, however, is proved by the marked diminution of the hemoglobinuria following its removal. It will be interesting to hear further from this patient.

In both cases spinal anesthesia was used in the form of 2 cc of pontocain, with excellent relaxation and results, and there was no immediate postoperative shock as both patients were carefully prepared for the operation.

As the subsequent findings in the two cases was described fully by the previous paper, I will only take up here the usual change in the blood that occurs after splenectomy in general.

A temporary anemia plus a slight increase in reticulocytes usually occurs. This anemia is probably explained by the fact that the loss of the spleen removes from the body an organ possessing the property of aiding in the formation of erythrocytes, and when this property or function is slowly taken up by the rest of the reticulo endothelial system, the anemia gradually disappears.

The most striking change in the blood picture following removal of the spleen for any condition is the immediate increase in the number of platelets. Studies made in large series of cases show that a marked rise of the platelets occurs at once and continues to about the sixth to tenth day. The total count at its peak averages 150 percent over the original preoperative count. After a few days at this height the count gradually falls to normal or slightly below, but rarely reaches the low level of the preoperative count.

It is in purpura hemorrhagica, where the preoperative platelet count is the lowest, that the most striking platelet increase occurs, the count rising perceptibly within a few hours following splenectomy and continues to rise sharply to reach considerably above normal at about the eighth to the tenth day after operation.

Experimental removal of the spleen (11) on animals has yielded similar results with the high platelet count persisting for days or even weeks, and naturally one must look for a plausible explanation of this phenomenon. Studies of the blood entering the spleen and of the blood leaving it have not thrown any particular light on the subject, as the number of platelets entering and leaving the organ are approximately the same; however, the fact that the high platelet count persists for sometime following splenectomy shows that with the loss of the spleen there has occurred either a loss of an inhibiting action on platelet formation in the bone marrow or the failure on the part of the reticulo-endothelial system to take up the lytic or

destructive function on the platelets previously exercised by the spleen.

In addition to the platelet increase, splenectomy is also followed by increases in the number and probably the resistance of erythrocytes, and also increases in the lymphocytes, monocytes, and the cholesterol content of the cells and plasma.

The disappearance of the icterus in hemolytic jaundice, is based on the fact that the spleen caused the jaundice through the formation of excessive bile pigment by destroying red blood cells, hence the removal of the organ caused less blood or no blood to be destroyed, and consequently little or no bile pigment was formed.

#### SUMMARY

1. Splenectomy is on a sound surgical basis as to its indications, its operation, and its results.

2. The knowledge of the functions of the spleen is being constantly increased, but the need of the organ for the health of the organism is still considered nonessential, while a diseased spleen constitutes a serious menace to the elements of the blood in particular and through its influence to the welfare of the organism in general.

3. In the light of our present knowledge, thorotrast should not be used freely as an aid to diagnostic procedure in diseases of the reticulo-endothelial system.

4. The part played by the spleen in the various diseases associated with splenomegaly is still imperfectly understood, but that it is directly or indirectly responsible for the pathology present is amply proved by the benefits derived in these conditions by its removal.

5. Splenectomy has gained a definite place as the treatment par excellence in hemolytic jaundice, purpura hemorrhagica and splenic anemia.

6. In the two cases presented, the diagnosis of hemolytic jaundice was well established, even though the second case presented a feature not commonly met with in this diseases, viz, hemoglobinuria.

#### REFERENCES

- (1) Oxford Surgery, Vol. 3, Page 207.
- (2) Surgery of the Spleen, B. Moynahan, Br. Journal of Surgery, 8-307—1924.
- (3) Dean Lewis System of Surgery, Vol. VI, Chapt. 15-2.
- (4) Whitaker, P. H., Davie, T. B., and Murgatroyd, F. Hepato-Lienography by the Aid of Thorotrast. Its Uses and Dangers. Quarterly Jr. of Med. 2: 49-58, Jan. 1933.
- (5) Buengeler, W., and Krautwig, J. Is Hepatollenography with Thorotrast a Harmless Diagnostic Method. Klin. Wchnschr. 11: 142-144, Jan. 23, 1932.
- (6) Year Book of General Medicine, 1933, Page 717.

- (7) Journal A.M.A. March 18, 1933, P. 839.
- (8) (Ed.) J.A.M.A., April 8, 1933, Page 1131.
- (9) A. J. Walton, Indications for and results of Removal of the Spleen, *Ann. of Surg.* 98: 379-384, Sept. 1933.
- (10) Giffin, H. L., Splenectomy, *Surg. Gyn. and Obst.* 45: 577-1927.
- (11) B. R. Shore and Katherine V. Kreidel, Studies of the Blood Platelets After Removal of Ruptured Spleen, *Ann. of Surgery*, Vol. 90, Feb. 1934, P. 307.

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#### MEDICAL OBSERVATIONS IN THE TROPICS\*

By E. U. REED, Captain, Medical Corps, United States Navy

Mr. President, members of the society, and guests: In reviewing the medical observations made during quite a number of years spent at tropical stations, a few impressions stand out quite vividly, and I believe that the following may be of interest to you.

The first of these concerns yaws and its relationship to syphilis. This subject has been discussed for many years. Thomas Sydenham, Jonathan Hutchinson, and other pioneers in medicine insisted upon the syphilitic nature of yaws and the similarity of the causative organisms and response to similar therapy later strengthened this belief, but for a number of years many European authorities have been misled by certain inoculation experiments and by slight differences in the biologic behavior of the causative organisms in the body tissues and have insisted that the two diseases were separate and distinct. Admiral E. R. Stitt and Capt. C. S. Butler, of our corps, have in recent years done much to correct this error.

My first introduction to yaws was in Samoa 22 years ago. There it was a disease of childhood, spread by contact and flies and often persisting through adult life in untreated cases in some mild tertiary form. The only lesions I had previously seen which at all resembled yaws lesions were some of the old rupial syphilides at Blockley Hospital before the days of salvarsan.

The Samoans are of Polynesian stock, like the original Hawaiians. Their islands have been visited for 300 years or more by white men in whalers and tramp ships, as well as in passenger ships and naval vessels. The many opportunities for introduction of venereal diseases cannot be denied. During 2 years of duty in American Samoa, with almost daily professional contact with the Samoans, I did not find among them a case of syphilis as we know it in this country, nor could I find any record of syphilis acquired by our sailors in American Samoa, but I treated hundreds of cases of yaws. It was as prevalent as measles or chicken pox are here.

A few years later in Haiti the majority of the natives in the cities and towns apparently had syphilis, either active or latent, and about

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80 percent of the dwellers in the country districts were estimated to have yaws.

In more recent years a tour of duty in Guam, where the original Polynesian stock has been diluted by many other racial bloods, revealed very few cases of syphilis, many cases of yaws, and much gangosa, which is now recognized as a tertiary form of yaws and so closely resembles the ulcerative destruction of the nose and throat that we often saw in late syphilis before the days of salvarsan.

These mass experiments conducted by nature in different parts of the world with resulting immunity in varying degrees are to me far more convincing than the apparently adverse inoculation experiments, and I am convinced that yaws and syphilis are the same disease modified only by the mode of transmission and the degree of natural and acquired resistance to the infection.

Another interesting observation was that the Samoans apparently did not have gonorrheal urethritis or salphingitis. The only cases I saw in American Samoa, with a native population of about 7,500, were in a mestizo woman from German (now British) Samoa, who contracted the disease before coming to our group of islands, and a few sailors, infected during trips to other countries. The few cases of salphingitis that I saw were attributable to puerperal infections.

If gonorrhea of the genito-urinary tract had been prevalent, I believe I would have seen it, because I had charge of and performed about 200 major operations a year in a native hospital, and I was on the alert for evidences of gonorrhea or syphilis.

None of our sailors contracted gonorrhea or syphilis in American Samoa during my tour of duty, to the best of my knowledge, and in the absence of other sources of treatment, I feel reasonably sure that I would have known it if they had.

What protected these people from gonorrhea as yaws apparently did from syphilis?

They had another very interesting disease of childhood, spread by contact and flies, called Samoan conjunctivitis. The symptoms and sequellæ were similar to those of gonorrheal conjunctivitis, except that they were usually less severe. Blindness did, however, not infrequently result. Year after year, especially during the breadfruit season when the flies were most numerous, the children were re-infected with this conjunctivitis until they apparently developed some degree of immunity; and the young adults apparently had some immunity to gonorrhea of the genito-urinary tract.

Gonorrhea was reported to be very prevalent throughout the South Sea Islands as early as 1796 by the missionaries, it being stated that one out of every four persons suffered from it at that time.

A purulent ophthalmia was reported as prevalent in Samoa in 1830 and occurring in epidemic form during the fly season.

In 1908, the present Surgeon General of the Navy, Admiral Rossiter, noted the prevalence of this eye infection and described the causative organism: an intracellular, Gram-Negative diplococcus quite similar to the gonococcus. He also reported that gonorrhea of the genito-urinary tract was quite rare.

Treatment with the silver preparations was introduced and its beneficial results soon made it popular with the Samoans.

In 1912 and 1913, during my tour of duty in Samoa, this form of conjunctivitis was very prevalent and, as I have stated, gonorrheal urethritis and salphingitis were apparently very rare.

In 1923, 15 years after Admiral Rossiter's observations, Commander Daniel Hunt of our corps reported that for the preceding 2 years there had been no epidemics of conjunctivitis as severe as those of previous years. He also reported that gonorrhea was not uncommon and concluded that the cause of Samoan conjunctivitis was an attenuated form of the gonococcus.

It therefore seems reasonable to believe that these repeated attacks of Samoan conjunctivitis protected the Samoans against gonorrhea of the genito-urinary tract until the recurring conjunctivitis attacks were greatly reduced in number and severity by treatment with the silver preparations.

A somewhat similar observation concerns the apparently increased resistance of primitive peoples and country dwellers to pyogenic infections, except when this resistance is reduced by chronic disease or undernourishment.

I cannot in any other way understand the mild and infrequent postoperative infections I have encountered when operating under very primitive conditions and with inadequate apparatus for sterilization of dressings.

Dr. Ferdinand Herff noted the rapidity with which wounds healed after operations under the most primitive conditions in southern Texas 80 years ago, as compared with his experiences in the European clinics. This was attributed to an unusually pure atmosphere in southern Texas, but I believe it was due more to the increased resistance to pyogenic infections of a people who lived under more primitive conditions than the city dwellers and went barefooted a great deal and often had some minor infected cuts and bruises to keep their resistance high. The environment plays a great part, of course, as we know from our experiences with puerperal infections, but repeated skin infections probably have an important role in the development of a relative immunity.

Another very interesting observation in Samoa concerned appendicitis. I could find no record of any cases of acute appendicitis in the natives, except in conjunction with acute pelvic inflammation, which occasionally followed abortions or puerperal infections. The

only white case recorded was a sailor, who had suffered several attacks before coming to Samoa. Then quite suddenly a veritable epidemic of acute appendicitis developed. Among about a dozen officers, 5 had acute appendicitis within a few months. I also operated on several enlisted men and on 1 native for acute appendicitis.

In trying to determine a probable cause for this sudden appearance of appendicitis, the only change we could find was in the meat supply. Prior to 1912 meat had been brought in alive, butchered on the island, and eaten within a short time as we had no cold-storage facilities. Pork and chickens were raised on the island and fish were plentiful.

In 1912 a cold-storage plant was installed and we also began to get fine cold-storage meats from Australia on ships that began that year to make regular stops on their way to Honolulu and San Francisco. This cold-storage meat was so much more tender than that to which we were accustomed that we were rather gluttonous for awhile. The native was a member of the Fita-Fita guard, which was also fed some of the cold-storage meat.

In 1904 an analysis of 22,000 patients among Rumanian peasants showed but 1 case of appendicitis. They lived mostly on vegetables. The Rumanians living in the cities, chiefly on animal diet, were frequently affected. Keen also reports that the vegetarian diet of the Japanese and the Indians of India seems to protect them against appendicitis. He also mentions the absence of appendicitis among the Arabs living in tribes and on vegetables, with its prevalence among those in cities, where meat is the chief diet.

The Samoans had an abundance of fish, chickens, and pork, and gorged themselves with these meats at their feasts, but they were not subject to acute appendicitis, except secondarily to pelvic inflammation.

There are many other factors involved, of course, in the development of acute appendicitis. The Samoan appendices, of which I saw quite a few, were better developed muscular canals than those usually found in white people. I suspect that in the dark-skinned races this is not uncommon and is probably due chiefly to the differences in diet.

Other peoples have for centuries gorged themselves with meat at their feasts, as the Samoans did, but the great increase in acute appendicitis during the last 50 years has, I believe, been coincident with the development of cold storage of meats.

The eating of the more tender meat following prolonged and often irregular refrigeration may result in the presence in the cecum of a better medium for the virulent development of bacteria. The products of decomposition and the bacterial toxins in the cecum



may also be more irritating to the appendix when refrigerated meats form a large part of the diet.

I realize that these opinions may not be subjected to conclusive proof, but I hope that their discussion may throw further light on these interesting subjects.

#### REFERENCES

- Stitt, E. R., *Diagnostics and Treatment of Tropical Diseases*, 1929.  
Rossiter, P. S., *United States Naval Medical Bulletin*, 1908.  
Butler, C. S., *United States Naval Medical Bulletin*, July 1928. *International Clinics*, ser. 40, 2: 1-14, 1930; *J.A.M.A.* 102, 2: 148, 1934 and *Amer. J. Clin. Path.*, Mar., 1934.  
Hunt, D., *United States Naval Medical Bulletin*, April, May, and October 1923.  
Bluem, M. J. (Ferdinand Herff), *Southwest Texas Medicine*, March 1934.  
Keen, W. W., *Surgery, Its Principles and Practice*, 1919.

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#### VINCENT'S DISEASE

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One of the greatest authorities of medicine and surgery once made the statement (1) that "Seventy-five percent of human ailments come from what goes into the mouth, including food and drink, from the diseases of the mouth which cause local and general disease, and from focal infections which may remain a cause of disease over a long period of time."

Vincent's disease is an acute, subacute, or chronic communicable disease, caused by fusiform bacilli in symbiosis with a spirochete. It has been designated under various names as ulcerative angina, ulceromembranous angina, putrid sore throat, angina diphtheroides, trench mouth, trench gums, ulceromembranous gingivitis, ulcerative tonsillitis, Vincent's angina. From the varied names by which this disease is known it will readily be seen that the site of invasion and the immediate localization of the causative organism is primarily the mouth and throat.

The symbiotic association of *B. fusiformis* and *V. spirochete* as a cause of disease was recorded in medical history a number of years previous to Vincent's excellent paper on that subject. Rauchfuss noted the association of fusospirilla in ulceromembranous angina in the year 1893. Plaut described the organisms in five cases of ulcerative angina in the year 1894. These cases appeared in the course of a study of a large number of patients suffering from diphtheria. He termed the organisms "Miller's bacilli" and "Miller's spirochetes" respectively. Thus, Willoughby D. Miller (an American dentist) (2) was credited with having described the association of spirochetes

and bacilli (longer than the diphtheria bacillus and pointed at the ends) as early as the year 1883.

In the year 1896 Vincent, a French Army surgeon serving with the colonial army in Africa, described fusiform bacilli and spirilla in cases of hospital gangrene, and observed that similar organisms were found in ulcerative anginas. The following year Bernheim reported fusiform bacilli as being present in a series of 30 cases of stomatitis and angina. Then in the year 1898 Vincent described so accurately a series of 14 cases of ulcero-membranous angina in which the fusospirilla were found that the disease caused by these organisms has been designated by his name (3).

At the present time it is quite generally accepted that the causative factors of Vincent's disease are a bacillus and a spirochete, in symbiosis—*B. fusiformis* and *S. vincenti*. A number of investigators however are of the belief that the spirochete plays a small part, if any, in the etiology of disease, the bacillus alone being the actual culprit. *B. fusiformis* are slender rods 4 to 8 microns long and have a thickness at the center varying from 0.5 to 0.8 microns. They taper gradually from the center to the ends, which may be either sharp points or blunt ends. Distinct motility in saliva has been observed by Stitt (4) and others. These bacilli stain best with Giemsa's stain, Fontana's method, Löffler's methylene blue, or Sterling's aniline gentian violet. The last is preferred by many for study of the morphologic detail of the organisms.

Two morphological types have been observed although it is quite possible that others remain undiscovered. With Giemsa's stain one type is a slender pale-blue rod with maroon dots at either side, while the second type shows uniform staining. Aggregations of the bacilli may resemble *B. diphtheriae* at times from which differentiation can be made with the Gram stain. *B. fusiformis* do not take the Gram stain. They are anaerobes and produce a fetid odor in cultures. Though difficult to cultivate, this was accomplished as early as 1905 by Weaver and Tunnicliff (5).

The spirilla are usually somewhat longer than the fusiform bacilli and are made up of a number of undulations. They are slender organisms and stain fairly well by the silver methods. They do not take the Gram stain. They are very difficult to cultivate, and have two types of motility—a lashing type and a boring corkscrew motility. The description of the morphology of the spirochetes in current literature is rather meager. Nor has it been settled definitely whether or not there are several species that may enter into symbiotic relationship with the fusiform bacillus. Some observers, notably Tunnicliff (6) conclude that the *B. fusiformis* and spirilla are different forms in the life cycle of one organism, but this conclusion is not commonly accepted.

It has been held by many authorities that the fusospirilla are secondary invaders of necrosed or diseased tissue. While other investigators are of the opinion that pyogenic cocci are the actual secondary invaders. In all probability the latter viewpoint is the more substantial. Again, there are those who question the value of an examination for the presence of Vincent's organisms as a means of establishing a pathogenic relationship of these organisms to a suspected lesion. Though it has been recorded that when Vincent's organisms are injected into guinea pigs, lesions of a constant character are produced similar to those observed in human beings (4). There may be some contention, pro and con, as to whether or not the fusospirilla are original or secondary invaders, or as to the possibility of other bacteria being primary or secondary invaders in Vincent's disease, but there can be no question but that the symbiotic organisms are the actual etiological factors in this disease.

There is a strong probability that the *S. vincenti* is identical with *S. schaudinni* (the organism found in tropical ulcer) and *S. bronchialis* (the organism of broncho-pulmonary spirochetosis of Castellani). Many investigators consider these spirochetes to be identical as they have the same morphological characteristics.

The lesions presenting themselves in Vincent's disease are not confined exclusively to the mouth, although the mouth is the region in which they are most prevalent. They may occur on the mucous membrane of any part of the body. The recognition of this point is very important. The lesions in the mouth are not sought for by private practitioners as frequently as they might be—especially in rural communities—and certainly the lesions, other than those in the mouth, are not commonly observed or treated with these organisms in mind as being the cause of the pathology.

The diagnosis of infections due to fusiform bacilli and spirochetes, according to Kilduff (7), depends upon, first, a knowledge of their normal habitat and distribution; second, an appreciation of the fact that they may invade adjacent tissue or may be transplanted to adjacent tissues; third, the characteristics and the symptomatic picture presented by the infection; fourth, microscopic examination of the smears, secretions, or sputum as the case might be. The organisms of Vincent will be found with other pyogenic organisms, in all probabilities, when the smears, secretions, or sputum are examined under the microscope, but the presence of fusospirilla in predominant or overwhelming numbers is diagnostic when taken with the symptomatic picture.

The usual or common sites where the *B. fusiformis* and *S. vincenti* are invariably found are the mouth (especially between the teeth), the throat, and the genitals. In these regions, the organisms are encountered so frequently in such a large percentage of persons that a num-

ber of investigators consider those areas a normal habitat, where the organisms lead a saprophytic existence. It is difficult to conceive them leading this manner of existence for any great length of time. Any area harboring these organisms must be considered unclean, at least, and possibly diseased. The infection may be so small as to escape notice at the beginning, but it is only a question of time before it manifests itself in a pronounced manner. Yet these organisms are present in the mouths and throats of a large percentage of persons. Showalter (8) was so much impressed by the frequency of positive reports from the laboratory on smears from the gums for Vincent's organisms that a laboratory examination of the gums of his patients was ordered by him as a routine procedure. The first 100 patients examined revealed the presence of the spirochetal organisms in 76 percent of the cases. Of this number, examination of the mouth revealed that 25 percent had a diseased condition. Giese and Briskman (9) made a routine examination by smears from the mouth of every one of the inmates at the Union Printers' Home, Colorado Springs, Colo., and found 93.5 percent of those persons were positive for the organisms. In all, 500 were examined. During the year 1931 this writer had smears taken from the mouths of 110 consecutive patients, immediately upon admission to a naval hospital. Seventy-four of the total number were Veterans' Bureau patients, the remainder were Navy and Marine Corps patients. Of the total number examined, 90.9 percent were positive for both bacilli and spirochetes, and 94.8 percent were positive for *B. fusiformis* alone without the spirochetes. All the patients had been admitted for treatment for disease other than Vincent's disease.

The work of Brams and of Davis and Piolet (10) has established the frequent occurrence of Vincent's organisms about the genitalia. The former found that the preputial secretions of 50 percent of 100 men examined showed the presence of these organisms. Twenty-one pregnant women, of 36 examined, gave positive smears from normal smegma. Fusospirilla were found about the clitoris in 58 percent of normal women by Davis and Piolet. They were rarely found in the vagina, as conditions there are not normally favorable for their existence.

Vincent's organisms in the mouth are not confined to adults. They are frequently found in the mouths of children, though probably not in the mouths of as large a percentage as of adults. Mitchell (11) reported a case of Vincent's disease in a 6-months-old infant that had no erupted teeth. This infant had a grayish patch over the site where the lower incisors would eventually erupt. Examination of the specimen from the area involved revealed the organisms, and specific treatment cured the condition. Apparently no age is exempt. Though, generally speaking, Vincent's disease is more prevalent as

age advances, and much more frequent in persons with dental caries, the disease is rarely found in those persons with sound teeth or in those persons who have had all teeth extracted.

Clinically the manifestations caused by fusospirilla infection may be multiple and are so recognized, though bacteriologists still discuss the relative importance of the bacillus and the spirillum. The subjective symptoms vary, but the lesions have a characteristic odor, are painful and destructive and progress, if untreated, from an exudative inflammation to the formation of an ulcer with a pseudomembrane which may resemble the pseudomembrane of diphtheria. The lesion may vary from a single almost invisible spot to a diffuse foul-smelling membrane-covered ulcer. This ulcer, according to Moure (12), may comprise three zones—a superficial zone, where the usual microorganisms of the region especially are found; a middle zone, where bacilli or spirilla practically exist alone; a deep zone, where only fusiform bacilli exist. The single spot is at first a red area of irregular outline with a whitish or grayish patch in the center and a red zone beyond. It may be confused with leukoplakia, although Vincent's lesions and leukoplakia may occur together. The diffuse lesion is a multiplicity of single spots.

The symptoms of Vincent's disease vary as to the location and extent of the lesion or lesions of the disease, and according to the temperament and general physical condition of the infected person. The attack may be mild or severe. The patient may be in a rundown physical condition with lowered resistance or may be of a high-strung, nervous temperament, all of which would have an influence. Many cases who have infection of the gums are not acutely ill or incapacitated for work. In fact, they appear to have a strong tendency to neglect receiving treatment and thus permit the infection to continue on from an acute course to a chronic termination. Meanwhile, they distribute the infection to those with whom they come in contact. As a rule, the general symptoms and signs include a certain degree of restlessness, malaise, mental depression, increased flow of saliva (if the lesion is located in the mouth or throat), anorexia, headache, coated tongue, lassitude, lack of continued mental concentration, inability for sustained effort, pain together with hemorrhage, elevation of temperature, ulcer with pseudomembraneous formation, and fetid odor, which is characteristic. All symptoms may not be present, but some will present themselves from time to time. The signs are always present. Disease of the tonsils or throat usually causes great prostration, difficult deglutition, dysphagia, lymphadenopathy, swelling of the salivary glands (especially the submaxillary and sublingual), and chills and fever in addition to the general symptoms enumerated above. Thompson (13)

records a "so-called 'neurotic pain' in the side of the head or the face, earache, and pain in the mandibular joint", which cleared after proper treatment. The teeth were apparently normal and the mouth healthy. There is a considerable degree of toxicity in some severe cases of Vincent's disease. This should be borne in mind in connection with the differential diagnosis between this disease and diphtheria.

The organisms of Vincent may produce lesions elsewhere in the body besides those in the mouth and tonsils. As a moderate gingivitis, a phagedenic gingivitis or even an ulceromembranous angina the lesions are most frequently encountered. Noma or cancrum oris and the putridity of the lesions of pyorrhea with resultant amount of necrosis and possibly stomatitis are commonly accepted as being caused by these fusospirochetes. But lesions do occur elsewhere and the organisms are not investigated in many instances as having an etiological relationship.

Vincent's disease of the nose is a rare infection, nevertheless cases are recorded. Shulman (14) reports a case in a boy aged 3 years. Patient had a bloody discharge from nose. Fetid odor. Excoriation of skin about the nostril, later swelling of the cervical lymph nodes left side of neck. The following day the left half of the upper lip became swollen, and bleeding from gums occurred. Somewhat toxic on admission. Appeared to have diphtheria. Left nostril and left half of upper lip involved. Membrane on mucous surface upper lip almost continuous in places with a sloughing membrane of the upper gums. Left submaxillary and left submental glands were much enlarged. Left cervical glands enlarged but not tender. Patient received diphtheria antitoxin. Direct smears from the nose and throat showed an enormous number of fusiform bacilli and spirochetes. Other smears taken later showed fusospirilla in abundance.

Ulceromembranous laryngitis is a disease that may follow an angina of the same name, but can exist alone, according to E. J. Moure (12). Even in the course of eruption of a wisdom tooth the fusiform bacilli and spirochetes may invade the upper portion of the respiratory tree. Examination reveals their presence associated with other microbes.

Until recent years, Vincent's organisms had received scant attention in the United States as a causal factor in bronchial and pulmonary disease. In the year 1906, Castellani described a group of cases observed in Ceylon in which a spirochete was considered the cause. He termed this organism *S. bronchialis*. Some observers have concluded that it is identical with *S. vincenti*. Until 1918 spirochetal infection of the lung was considered generally as a tropical disease. Haden (15) states that only 107 cases of all

types of fusospirochetal lung infection had been reported until the year 1927, though fusospirochetosis is undoubtedly a more prevalent disease as a clinical entity than the reports indicate. The fusospirilla may be one, if not the sole etiological factor, in acute, subacute, and chronic bronchitis, bronchiectasis, abscess of the lung, and gangrene of the lung. Probably, cases of acute bronchitis due to these organisms occur often in clinical practice.

The chronic bronchitis type of Vincent's disease may resemble pulmonary tuberculosis in many particulars. There is a purulent expectoration, possible blood-streaked, loss of weight, and a fetid odor to the breath. Accompanying these signs, there may be a fever of a low grade running an irregular daily course, secondary anemia, emaciation, and hemoptysis. Freed (16) suggests a routine examination of sputum for spirochetes and bacilli in all cases of suspected tuberculosis, which are negative for tuberculosis bacilli and in all cases of chronic cough, with or without blood-streaked sputum. In a routine sputum examination for tuberculosis bacilli or with the Gram stain, the organisms are not seen. The sputum must be washed through successive changes of physiological salt solution to eliminate mouth contaminations. A very thin smear is made on a slide, covered with Sterling's gentian violet, washed off immediately under the tap, dried, and examined.

The presence of fusospirilla in abscess of the lung was demonstrated by Bucher (17) in 22 percent of a series of 118 cases. The pus was collected directly from the bronchus by the bronchoscope, and also obtained from an open operation when opportunity permitted. The organisms were identified, for the most part, by their morphology and motility in the dark-field examinations and by smears stained by Fontana's method, or with Sterling's aniline gentian violet. The same observer found 3 cases of abscessed lung following operations remote from the lung, 1 a prostatectomy, 1 a drainage of the gall bladder, and the last followed a forceps delivery in an obstetrical case. All the operations were performed under general anesthesia and the pulmonary abscesses were caused by spirochetes. Evidently the organisms were aspirated from the mouth in these operative cases. In view of the prevalence of the organisms in the mouth, possibly many cases of bronchial infection may follow tonsillectomy or ether (insufflation) pneumonia.

There is a strong suspicion that Vincent's organisms are at times the causal factors in the production of peptic ulcer and gastroduodenitis. Certain it is that these organisms produce an ulcerous condition of mucous membranes. It is reasonable to presume that in persons with bad dietary habits, with oral sepsis, diseased tonsils, etc., disorders of digestion are bound to ensue, effecting a fertile soil for growth of the organisms in the stomach and duodenum.

Membranous enteritis may involve the biliary passage in a similar manner. The mucous membrane of the duodenum is continuous with the mucous membrane of the common gall duct. Ulcers are frequently found in the bile ducts and gall bladder. They may be superficial in character, large and irregular, or quite deep and small. They are often covered with a gray gangrenous detritus, which is removed with difficulty.

Vincent's organisms are the cause of mastoiditis and acute otitis media in many cases. More so than the general reports of cases of these diseases indicate.

Brain abscess may result from infection from Vincent's organisms. Thompson (13) reported a fatal case following extraction of a second molar tooth under local anesthesia. Autopsy revealed an abscess of the right temporal lobe, typical of Vincent's angina, presenting Vincent's organisms on smear examination.

Corbus is quoted by Siler (18) as having described ulcerative balanitis as a result of Vincent infection as the "fourth venereal disease." The same author reports Campbell and Dyers as having described four cases of balanitis of Vincent origin. The opinion was expressed that it was often diagnosed as "chancroid." The habitat of Vincent's organisms in the preputial secretions (especially those with a long phimotic foreskin) in such a large percentage of persons predisposes countless numbers to the disease, ulcerative balanitis. There is small doubt but that in most instances it actually is mistaken for balanitis resulting from chancroid.

Doubtless many cases of vaginitis with its sequellæ may be the result of fusospirilla infection. Under normal conditions these organisms do not thrive. But when the normal functions are upset the part is subject to infection. The disease is attended with loss of surface epithelium and ulceration. In the acute, diffuse type of vaginitis the discharge is profuse with a fetid odor. A croupous membrane is present. Ulceration and atresia may be the end results (19). There is a leucorrhæal discharge with the characteristic fetid odor. This may tend toward chronicity. The disease with accompanying leucorrhæa is more prevalent than reports indicate.

A rather unusual case of Vincent's disease of the vagina followed the infection in the mouth, in one of Arnold's (20) cases. A housewife presented herself for treatment because of weakness, fever, nausea, and sore mouth. A week or two previously she had begun to feel ill. Past history negative, except for a rather profuse leucorrhæa. Physical examination, conducted at the time, revealed a decided foul odor of the breath, profuse salivation and grayish white patches on the gums, in addition to an eroded cervix, endocervicitis, and a profuse discharge. Smears taken from the mouth were positive for fusospirilla. Two weeks later the patient again



returned for treatment for an ensuing vaginal condition. The condition in the mouth had improved greatly. A vaginal examination showed a characteristic grayish white patch 1 cm in diameter, just within the vaginal orifice, surrounded by an area of inflammation. From this emanated the characteristic odor. Smears revealed Vincent's organisms.

*Ulcus vulvæ acutum* first designated as such by Lipshutz, according to Wien and Perlstein (21), is a disease characterized by the presence of ulcers which appear suddenly on the mucous membrane of the vulva or adjacent region and coexisting with ulcers of the mouth. The etiology of this disease has caused considerable discussion. A number of observers have reported the condition. Though it has been maintained that *B. crassus* is the prime etiological factor, Schnable, in 1927, reported a case (21) in which he demonstrated fusospirilla in the mouth lesions and vulva lesions of the patient.

The nefarious operation, designated as criminal abortion, produces in many cases infection of the uterus by Vincent's organisms. A case is recorded by McIntyre (10) in which a patient entered the hospital suffering from the after effects of one such operation. Patient was extremely sick and very anemic; hemoglobin, 30 percent; erythrocytes, 1,570,000; leukocytes, 7,600; polynuclears, 90 percent. At autopsy, the cervical part of the uterus showed hemorrhagic extravasation with a membranous exudate on the surface. Smears from the uterus revealed spirochetes and fusiform bacilli morphologically and cultures showed a variety of cocci.

The effects of Vincent's disease on the hematopoietic system is the subject of lengthy discussions and has been the cause of numerous investigations and close observations over a considerable period of time. It has been recorded by some observers that in a certain number of cases of this infection there is a reduction in the number of erythrocytes. Others maintain that there is quite a series of cases showing a leukopenia with a relative and absolute decrease in polymorphonuclear leukocytes and with a relative and sometimes absolute increase in mononuclear leukocytes. The records of cases indicate that there is, in many instances, a radical divergence from the normal in either the number of red cells or the white cells or possibly both types, in those infected with this disease. It has been held that the blood-forming tissues do anticipate demonstrable signs of infection and begin early to respond or react to such an invasion. In this respect, Vincent's organisms are deemed by some to have an etiological relationship in infectious mononucleosis; agranulocytosis; aleucemic leukemia.

Infectious mononucleosis was first described as a clinical entity in 1920 by Sprunt and Evans, according to Cottrell (22). This

disease of essentially young people is highly communicable with a tendency to epidemicity. In addition to the common prodromal symptoms of a general infection, glandular enlargement, sore throat, and a generalized aching, malaise, chills, or fever (slight) may usher in the disease. In most cases there is an ulceration or exudation of the tonsils or pharyngeal wall. At the height of the disease the patients are toxic and the enlarged lymph glands cause considerable discomfort. The total leukocyte count is usually increased, although it may be quite normal early in the disease and during convalescence. The characteristic cells are lymphocytes (22). Many are young and comprise 40 to 75 percent of all leukocytes. In 6 of 12 cases of Cottrell's (22) series, showing ulceration or exudation, smears from the lesions were positive for Vincent's organisms. Cottrell is of the opinion that the association of the spirilla of Vincent and fusiform bacilli with infectious mononucleosis is frequent enough to give rise to strong suspicion, at least, of a causal relation.

Agranulocytosis is a term for a disease entity first suggested by Werner Schultz in 1922 (Ueber eigenartige Halserkrankungen, Deutsche med. Wchnschr. 48: 1494 (Nov. 3, 1922)). The term implies a condition in which the granular cells practically completely disappear from the peripheral blood. Many now consider Granulopenia a more fitting term, as it expresses more accurately what actually occurs, viz, a decrease in the number of the granular cells in the peripheral blood. In this disease the average white cell count is reduced to a variable range of 2,000 to 3,000 cells, though the count may go as low, or slightly lower than 1,000. The number of red cells may be reduced as low as 2 million. Now the normal white count range, according to Needles (23) is 6,000 to 8,000 with an average percentage as follows: Polymorphonuclear cells, 70.05; small lymphocytes, 20.32; large lymphocytes, 4.32; monocytes, 3.24; eosinophiles, 1.57; basophiles, 0.5; 5 to 7 cells above or below are normal. That observer concludes that our present knowledge of the blood picture in health and disease is none too complete, and is spotted with areas of conjecture. McCord (24) on the other hand, holds that the widely accepted notion that the normal human white count is 7,500 per cubic millimeter, and that this number is essentially constant is probably erroneous. He holds that white cells may fluctuate from 4,000 to 8,000 per cm, or from 6,000 to 12,000 within physiological limits, without external or internal stimuli, during the course of the day, depending upon the person, the physiological condition of the moment, and the time of the day the observation is made.

Agranulocytosis, caused by micro-organisms, clinically resembles Vincent's disease. Attention has been called to this fact time and again in medical literature. The prodromal symptoms are practi-

cally the same and the disease goes on to the formation of ulcers of the mucous membranes in various parts of the body. Usually the mouth and throat areas are involved, and mild or moderately severe attacks are subject to remissions. Severe attacks invariably have a fatal ending. The disease may be produced in human beings by the toxic effect on the bone marrow, by benzine, arsenical therapy, etc. Many cases having been reported. Kracke (25) produced experimental agranulocytosis in rabbits by subcutaneous and intraperitoneal injection of benzine over long periods. Commonly the disease is produced by infection with micro-organisms. There is considerable discussion as to whether the bone marrow depression of this disease, resulting in a loss of neutrophilic resistance precedes the local infection or follows it (25). It appears possible that the large number of patients who give a history of oral infection prior to their attack of neutropenia had a depression of the bone marrow due to invasion by mouth organisms.

Vincent's organisms are mentioned frequently as etiological factors in agranulocytosis (granulocytopenia). Kracke (25) states that in 1913 Larson and Barron reported a case in which the fusiform bacillus was isolated from the blood stream. Their patient died after running a septic course with ulceration of the jaw and with a white cell count of 2,400. He feels that they were dealing with agranulocytosis and comments that the fusiform bacillus must be regarded with suspicion as an etiologic agent in this disease. McHenry (26) predicts some other specific bacteria will be found working in symbiotic action with Vincent's organisms to cause this disease. Arnold (20) states that in the past 4 years he has treated 20 or more cases of Vincent's disease of the mouth in 12 of which there appeared, at some stage of the disease, agranulocytosis, anemia, hemorrhage of greater or less degree, decreased blood platelets.

In the Tropics, where heat and moisture prevail, the most frequent form of ulcer encountered has been termed "tropical ulcer." The lesion usually is single, according to Strong (27), but occasionally there may be a second or several ulcerations present in the vicinity. The ulceration extends rapidly through the skin and subcutaneous tissue. Microscopic examination usually reveals a large number of spirochetes and fusiform bacilli. In pure cultures these organisms are encountered in enormous numbers. The spirochetes in symbiosis with the fusiform bacilli are *Spir. schaudinni*, an organism which is morphologically identical with the *Spir. Vincenti*.

"The Wasserman reaction is occasionally positive in Vincent's angina" (28). This statement is made without qualification in one of the standard textbooks of the practice of medicine. The correctness of this assertion is not commonly accepted by the members of the medical profession. This writer has had Kahn tests conducted

in a considerable number of incontrovertible cases of Vincent's disease, of the mouth and throat, with negative findings when syphilis was not superimposed. The following case came under the writer's jurisdiction, but not under immediate charge as to diagnosis and treatment, although consultation on certain aspects of the case was made. The case is interesting from the standpoint of a positive fixation reaction in blood dyscrasia, the presence of Vincent's organisms and lesion, and the fact that if first reports of blood tests had not been accepted with much conservatism and specific treatment withheld, irreparable damage would have ensued.

C-16100 was admitted to this hospital February 27, 1931, as with a diagnosis of "Diagnosis undetermined—Lymphadenitis, general." He was transferred from his ship with this diagnosis. This patient was married and the father of two healthy children. He was born April 2, 1902. His parents were alive and in good health. He had undergone a number of annual physical examinations and always had been found perfectly fit for performance of sea duty. The last annual physical examination had taken place less than 3 months prior to admission to this hospital. His current health record contained no entries of either disease or injury. No history of ever having had venereal infection. The history of the present illness dates back 2 weeks prior to admission to this hospital. The patient was at sea. He stated that at that time the roof of his mouth became sore and abraded. This he attributed to eating hard toast. A short time later he noticed a slight enlargement of the glands of his neck (posterior cervical and posterior auricular). They became tender to the touch. There was slight pain across the upper abdomen, more pronounced on the left side, with some increased gas formation. No previous history of gastric disturbance. He then became "more sallow", having lost a "good deal of color." Also had a moderate "cold", while at sea, and believes there was a certain amount of fever. The physical examination, conducted by the medical officer who recommended transfer to the hospital was in effect as follows: General appearance, sallow in appearance, but does not seem acutely ill. Tonsils injected and ragged. Buccal surface of mucous membrane reveals some fine white pinpoint areas. Lymph glands show a generalized enlargement of all groups. Degree of enlargement varies. The most enlarged are moderately tender to rather vigorous palpation. Enlarged glands not indurated. The glands along inner aspect of thighs appear "shotty" in nature. Other than the fore-mentioned the physical examination was essentially negative.

When admitted to this hospital the physical examination showed enlarged tender generalized adenopathy. The throat revealed ragged tonsils with a filmy exudate, suggestive of Vincent's disease.

The spleen was palpable. Temperature, 99° F.; pulse, 70; respirations, 18. Small excoriated area on left side of cheek on a line with the apposition of the upper and lower molars which was sore and painful when the tongue was pressed against it. Also soreness of the gums back of last left molar tooth. The edges of the gums were slightly excoriated, and the third lower left molar tooth was only partially erupted.

Specimens from the mouth and throat were positive for Vincent's organisms. Blood examination: Hemoglobin, normal; red cells, normal; *white cell count*, polymorphonuclear cells, 26 percent, small lymphocytes, 15 percent, large lymphocytes, 54 percent, transitionals, 5 percent. No medication internally was prescribed. A mouth wash of potassium chlorate (saturated solution) was the only medicament ordered during the patient's stay in the hospital. The third day after admission the patient's illness began to improve. A white cell count showed, polymorphonuclears, 38 percent; small lymphocytes, 24 percent; large lymphocytes, 36 percent; transitionals, 2 percent. Eight days after admission there was practically no enlargement of the lymph glands, the general condition of the patient had improved greatly, and the acute condition of his mouth and throat had subsided. The white cell count showed, polymorphonuclears, 36 percent; small lymphocytes, 54 percent; large lymphocytes, 9 percent; transitionals, 1 percent. Patient discharged to duty. To continue mouth wash prescribed.

The Kahn tests were rather interesting. The first test was done 3 days after admission as a routine procedure. The report received was Kahn four-plus. One week later another specimen of blood was sent to the laboratory for examination. Again the laboratory report was returned Kahn four-plus. Special attention had been given to that examination to insure accuracy. In addition a specimen of blood was forwarded to the laboratory at the United States Naval Medical School, Washington, D.C., and another specimen of blood was forwarded to the laboratory of the United States Naval Hospital, Chelsea, Mass. The report of the former was Kahn two-plus, Wassermann negative. The report of the latter was Kahn one-plus or two-plus. On the fourteenth day after admission to the hospital the patient returned for a Kahn test. The report of this test was Kahn three-plus. He again returned on the twenty-first day after admission to the hospital. The report of this test was one-plus. Finally a Kahn test was made 2 months later, and the report received was Kahn negative.

The number of case reports of Vincent's disease published before the World War indicate that it was a comparatively rare disease then. But it began to receive universal attention during the war when it became widespread on the western front. Among the Brit-

ish and French troops (especially in the trenches), "trench mouth", "trench throat", and "trench gums" was practically epidemic. It was just as prevalent among the German and Austrian troops. At least 20 percent of cases admitted to an American base hospital had Vincent's disease, according to Siler (18). This disease was not the original cause of admission to the hospital. Prior to the entrance of the United States into the war the ulcerative form of the disease was unknown in the United States Army. Shortly after the arrival of the American Army in France, "trench mouth" appeared on the United States Army sick reports, and as time went on the number of cases increased. In 1917 there were 261 primary admissions with that disease among enlisted men to the United States Army sick list. In the year 1919 there were 4,159 primary admissions with Vincent's disease to the United States Army sick list (18). Many soldiers returned to this country as chronic carriers of the infection.

In the United States Navy, Vincent's disease was classed as a disease of the digestive system prior to January 1, 1924, on which date a new classification placing it in the list of respiratory diseases went into effect. The nomenclature of the disease was changed at that time from ulceromembranous angina to Vincent's angina. In the year 1924, this disease occupied sixth place in the relative standing of all communicable diseases transmissible by oral and nasal discharges (29). During the years 1924 to 1928, inclusive, it increased progressively (except in 1927). The following 2 years there was a small decrease in the incidence. The rates of primary admissions per 100,000 during those years were as follows (29): 594 per 100,000 in 1924, 661 in 1925, 750 in 1926, 675 in 1927, 903 in 1928, 739 in 1929, 719 in 1930. There is the possibility that all of the officers suffering with this disease were not admitted to the sick list, merely undergoing treatment, no official record being made. In many cases the enlisted personnel were admitted to the sick list to insure proper care. It is a matter of interest that in the year 1930, for example, the admission rate for Vincent's angina was 719 per 100,000, yet the admission rate for gingivitis was 10 per 100,000 and for Vincent's infection oral only 3 per 100,000—the last two being classified under the caption "dental diseases and conditions."

Vincent's disease is not only infectious, it is contagious. It is transmitted by both direct and indirect contact. Saliva carries the infection most frequently. Any article capable of carrying saliva, as the hands, drinking glasses, eating utensils, tobacco pipes, towels, etc., may transmit the disease. A few years ago when individuals made their own cigarettes the infection undoubtedly was passed along by the common practice of closing the tobacco bag by pulling the draw string with the teeth. Chemical irritation, especially in the mouth, caused by the immoderate use of tobacco, exceptionally

hot drinks, undue amount of high spices in the food, etc., predispose to the infection. Mechanical irritation of the gums by loose crowns, poorly fitting partial dental plates, etc., serve to play their part in paving the way for the infection. In communities, barracks, and camps, where a large number of individuals are quartered, the infection may spread with great rapidity if the proper oral and bodily hygiene is not observed, and if the necessary sanitary precautions as to the eating utensils and drinking glasses especially, are not taken.

In this day, with the daily radio broadcasts, newspaper advertisements and newspaper and magazine write-ups, relating to the care of the teeth, mouth, and throat, it is rather surprising to find the huge number of persons infected with the organisms. Even though proprietary medicine manufacturers have brought that social bugbear of a condition popularized as halitosis into general understanding, oral prophylaxis is disregarded by innumerable persons in many communities. So much so that Vincent's disease appears to be rampant in endemic form in innumerable districts throughout this country. During the past 3 years, many patients with oral sepsis were admitted to this hospital. Practically all of these patients came from rural civil communities. Their past history indicated complete disregard for even a simplified form of oral hygiene. It is concluded that there is a tendency on the part of many of the medical and dental professions to overlook the seriousness of Vincent's infection. Judging from all reports and personal observation this infection is increasing rapidly in civil life.

The use of either potassium chlorate (saturated solution) or sodium perborate (1 teaspoonful dissolved in a glassful of water) as a mouth wash and gargle once daily, and brushing the teeth after every meal, is a routine practice that will prove to be highly beneficial as a prophylaxis for Vincent's infection of the mouth and throat. The mouth wash is to be used preliminary to brushing the teeth at night. Maloccluded teeth, carious teeth, faulty crowns on the teeth, improperly fitted or adjusted dental plates should be remedied. For other areas, mentioned before, where the organisms are so prevalent in a large percentage of persons that the regions are considered the normal habitat of the organisms, the frequent use of soap and water will answer the prophylactic purpose. The work of Reasoner and Gill has demonstrated the beneficial effects of soap for prophylaxis (30). Males with an elongated phimotic foreskin should, of course, be circumcised.

This writer has demonstrated the beneficial effects of a saturated solution of potassium chlorate used as a prophylactic procedure with a large number of men a few years ago while serving as medical officer on one of the large battleships in the battle fleet on the west coast. The ship had been for many months in a moderate climate

off the coast of southern California. During the latter part of January she went north to Puget Sound for 2 months' overhaul. At that locality the weather was inclement, cold, and damp, with considerable rain and light snow flurries. Immediately the number of admissions to the sick list increased to such an extent that considerable thought was given to the subject. A large percentage of the sick had incurred tonsillitis or pharyngitis; a comparative few, bronchitis. A short time later peritonsillar abscess developed among the cases of tonsillitis. Smears were taken from the throats of all patients, and Vincent's organisms were found in practically all in predominating numbers. This was difficult to account for, as the sanitary condition of the ship had always been excellent. The scuttlebutts had sanitary drinking-water nozzles, and the mess utensils had been sterilized after each meal; the ship was remarkably clean and was well ventilated and properly heated, etc. The personnel was well experienced in oral and bodily hygiene, and bathing facilities were ample. The average complement of the battleship was about 1,167 at that time. Immediately after it was concluded that Vincent's organisms were the causal factors in the increased number of patients carried on the sick list, steps were taken to prevent further spread of the infection. The enlisted personnel were marched to the sick bay by divisions each morning after quarters where each man received a saturated solution of potassium chlorate. He gargled and washed his mouth thoroughly with the solution. A short time later the number of admissions decreased rapidly. Though the ship stayed in Puget Sound for weeks, the number of cases of throat infection were few, if any. The mouth wash and gargle were continued each morning during the entire time the ship stayed in northern waters. This method of using potassium-chlorate solution among large bodies of men, as a prophylaxis in mouth and throat infections, had been learned during the World War when this writer served as medical officer aboard a battle cruiser performing escort duty with convoys of troop ships. It is felt that the use of this solution, under war conditions aboard a ship that was at sea for weeks at a time, decreased enormously the potential admissions to the sick list aboard a ship that was quite overcrowded and enabled that ship to continue at sea with high efficiency of the personnel.

The treatment for Vincent's disease is practically specific. For infection of the gums and mouth, Bloodgood (31) advocates a thick paste of chemically pure sodium perborate and water. This should be spread over all the teeth with the fingers. Any red or ulcerated spots in the mouth should be treated in the same way. The patient holds this paste in the mouth for 5 minutes. During this time it foams as the result of oxidation. At the end of the allotted time



the mouth is to be rinsed with warm water. When the oral cavity is involved with extension to the fauces and pharynx there must be, in addition to the above paste, a gargling with a thinner solution of sodium perborate 2 or 3 times daily. The paste should not be used too frequently as it may produce irritation. This writer has obtained good results with a solution of fresh hydrogen dioxide as a gargle in throat infections with the use of the above-described Bloodgood's paste, for the teeth. There are two preparations of sodium perborate on the market—one flavored, and the other unflavored. A greater preference is usually expressed for the unflavored preparation.

The use of bismuth preparations in the treatment of Vincent's disease is advocated by a number of clinicians. It is claimed that arsenical preparations have been proven inferior to bismuth in the results obtained in the treatment of this disease. Mangabeira-Albernaz (32) highly recommends the local daily use of a salve emulsion of bismuth tartrate (30 percent), as a local application, once daily, to be used in conjunction with any mild antiseptic gargle. Giese and Briskman (9) state that 1 injection of only 3 grains of bismuth caused 83 percent of cases to become negative for the organisms. These cases previously were positive for the Vincent's organisms after the use of neoarsphenamine.

Arsenical therapy intravenously has a depressing action on the bone marrow function, at times producing what Kracke (25) terms **agranulotoxicosis**. This is a condition following chemical poisons in which there is considerable reduction, if not entire disappearance, of the number of neutrophiles in the blood. A decreased number of neutrophiles may bring forth a series of subjective symptoms with lowered resistance and poor recuperative powers. Kracke (25) mentions one of his cases whereby the patient felt weak, tired, sleepy, and depressed when the leukocyte count averaged 4,500 with 40 percent neutrophiles, during a period of 4 or 5 days, while a mouth ulcer was noted at the same time. This ulcer healed promptly when the leukocyte count reached an average of 7,000 to 8,000. Judging from the foregoing it would be well to conduct a total leukocyte count as well as a differential leukocyte count prior to the intravenous administration of an arsenical preparation, and this laboratory examination procedure should be carried out at frequent intervals during the course of treatment with arsenic.

Excerpts from the report of a case published by Mink and Campbell (33) will serve as an example for the purpose of illustration. Case 59-1931 was admitted for treatment at Honolulu, Hawaii, as with an established diagnosis of syphilis. Neoarsphenamine was administered intravenously during the following 7 weeks. Seven doses (total 3.75 g) were given in that period of time. As con-

current treatment, the patient received 7 intramuscular injections of bismuth during the last 32 days of the course of treatment with neoarsphenamine. This writer is of the opinion that the bismuth had no effect on the sequel to the case. Two days after the seventh injection of neoarsphenamine the patient complained of headache, sore throat, and pain in the joints. There was an elevation of temperature and increased pulse rate. Laboratory examination showed: White count, 5,150; neutrophils, 27; lymphocytes, 64; eosinophiles, 7; mast cells, 2. On the fourth day following the last injection of neoarsphenamine the laboratory examination revealed: Red blood count, 2,680,000; white blood count, 5,500; neutrophils, 19; lymphocytes, 75; eosinophiles, 4; mast cells, 1. Two days later the patient presented "A local picture of extensive Vincent's angina involvement about the gums, which were ulcerated in areas, and involvement of the tonsils." The publishers of this case comment in part that, "A bone marrow depression had taken place", and "the condition can be described as an agranulocytic angina."

Arsenical compounds administered intravenously are of doubtful value in the treatment of Vincent's disease. They appear to have no appreciable antiseptic action or germicidal action on the bacillus fusiformis. Vincent's disease may be incurred while a patient is undergoing arsenical medication intravenously for syphilis—a disease upon which Vincent's disease is often superimposed.

The remedy employed for the etiological treatment of Vincent's disease should conform with five conditions according to Mangabeira-Albernaz (32); first, it should be absorbed by the tissue or should penetrate it to a considerable extent; second, it should be antiseptically active for an appreciable length of time; third, it should be neither caustic nor destructive; fourth, it should have a dissolvent action on the necrotic tissue; fifth, it should have a specific antiseptic action upon one or the other components of the symbiosis. This writer subscribes to the first four conditions postulated above, but believes that the medicament used for the etiological treatment of Vincent's disease should have a specific antiseptic action upon the bacillus fusiformis.

#### SUMMARY

1. Vincent's disease began to receive universal attention during the World War.
2. It is caused by *Bacillus fusiformis* and *Spirochete vincenti*.
3. These organisms are prevalent universally in the mouth. They are not confined to the mouths of adults exclusively. They are prevalent in certain areas of the genitalia in a large percentage of persons.

4. Their presence in predominating numbers indicates either disease or predisposition to disease.

5. They do not universally receive the attention or consideration as etiological factors in disease that their importance warrants.

6. Vincent's disease is contagious. It is transmitted by both direct and indirect contact. Saliva transmits the disease.

7. It is practically endemic in many communities, and is capable of assuming epidemic proportions.

8. The lesions of Vincent's disease have a characteristic odor, are painful and destructive. They may occur in areas other than in the mouth and throat.

9. Until recent years the organisms of Vincent have received very little attention as possible etiological factors in bronchial and pulmonary disease.

10. In many cases of infection of the respiratory tree the organisms of Vincent are unrecognized as etiological factors.

11. Cases of chronic bronchitis or cases having signs and symptoms of tuberculosis, where the *B. tuberculosis* are not found after frequent examinations, should have laboratory examinations performed to determine the presence of *B. fusiformis* in symbiosis with a spirochete.

12. Vincent's infection of the organs of respiration may follow a surgical operation performed in a remote part of the body under general anesthesia.

13. Pulmonary abscess or pulmonary gangrene caused by Vincent's organisms may follow tonsillectomy.

14. Vincent's organisms may frequently be causal factors in gastric ulcer or duodenal ulcer.

15. Extraction of a tooth should never be performed when there is Vincent's disease of the mouth or throat.

16. Vincent's disease may play a prominent role as etiological factors in certain cases of agranulocytosis (granulocytopenia), aleukemic leukemia, infectious mononucleosis.

17. This disease appears to be increasing in civil life. In the past 2 years, the incidence of infection has been decreasing in the United States Navy.

18. Potassium chlorate (saturated solution) or sodium perborate solution is recommended for prophylaxis, to be used in addition to oral hygiene.

19. Sodium perborate or bismuth considered specific remedies for treatment of Vincent's disease.

20. A blood examination is suggested prior to and during course of treatment, if one of the arsenical compounds is administered intravenously.

21. An arsenical compound administered intravenously may produce agranulocytosis. Microorganisms (possibly the organisms of Vincent) cause granulocytopenia in many cases.

22. The use of an arsenical compound intravenously in the treatment of Vincent's disease is not recommended.

#### BIBLIOGRAPHY

- (1) Lintz, William, Digestive Diseases and the Teeth. *Annals of Internal Medicine*, vol. 4, no. 9, (March 1931) p. 1188.
- (2) Lechtenberg, Henry H., Werner, Marie (B.S.) and Leuck, Esther Volckman (B.A.), The Pathogenicity of the Fusiform Bacillus and Spirillum of Plant-Vincent. *Journal A.M.A.*, vol. 100, no. 10. (Mar. 11, 1933), pp. 707-710.
- (3) Reference Handbook of the Medical Sciences, William Wood and Co., p. 428.
- (4) Stitt, E. R., Practical Bacteriology, Blood Work and Animal Parasitology. Eighth ed., P. B. Blakiston's Sons. pp. 585-587.
- (5) Weaver, G. H., and Tunnicliff, Ruth, The Occurrence of Fusiform Bacilli and Spirilla in Connection with Morbid Processes. *Journal Infect. Diseases* 2: 446, 1905.
- (6) Tunnicliff, Ruth, The Life Cycle of Bacillus Fusiformis. *Journal Infect. Diseases* 33: 147 (August) 1923.
- (7) Kilduff, R. A., The Role of the Organism of Vincent's Angina in the Production of Disease. *Inter. Med. Digest* 10: 369-376, June 1927.
- (8) Showalter, A. M., Vincent's Gingivitis. *Virginia Medical Monthly*. 56: 192-193, June 1929.
- (9) Giese, C. O., and Briskman, Treatment of 500 Cases of Vincent's Disease with Review of the Literature. *Colorado Medicine*. October 1930, p. 375.
- (10) McIntyre, A. J., Vincent's Infection about the Genitals, with Report of a Case of Uterine Infection. *Southwestern Medicine*. 12: 343-345, (August 1928).
- (11) Mitchell, J. W., Trench Mouth. *Jour of the Florida Med. Association, Inc.*, 15: 251-253, (November) 1928.
- (12) The Nose, Throat, and Ear and Their Diseases. Jackson and Coates. W. B. Saunders Co. 1930, pp. 823-826.
- (13) Thompson, L. E., A Fatal Case of Brain Abscess from Vincent's Angina Following Extraction of a Tooth Under Procaine Hydrochloride. *Journal A.M.A.*, vol. 93, no. 14 (Oct. 25, 1929), pp. 1063-1064.
- (14) Schulman, Harold, Vincent's Infection of the Nose. *Dis. of Children*. 36: 352-356, (August) 1928.
- (15) Haden, Russell L., Fusospirilla Infections of the Lung. *The Nebraska State Med. Jour.* 14: 146-148, (April) 1929.
- (16) Freed, Harold, Broncho-Pulmonary Spirochetosis. *Tex. State Med. Jour.* 21: 706-709, (April) 1926.
- (17) Bucher, Carl J., Abscess of the Lung. A Bacterial Study Based on One Hundred and Eighteen Cases. *Am. Jour. Med. Scs.*, vol. CLXIX, no. 3, (March) 1930, pp. 406-411.
- (18) The Medical Department of the United States Army in the World War, vol. IX, pp. 493-509 (1928).
- (19) Graves, Text Book of Gynecology, 3d ed. W. B. Saunders and Co., Philadelphia, Pa., pp. 244-245.

- (20) Arnold, Clement H., Plant-Vincent's Infection of the Vagina. *J.A.M.A.*, vol. 94, no. 19, pp. 1461-1463.
- (21) Wein, Max S., and Perlstein, Minnie O., Ulcus Vulvæ Acutum Associated with Lesions of the Mouth. *J.A.M.A.*, vol. 98, no. 16 (Feb. 6), 1932, p. 461.
- (22) Cottrell, James E., Infectious Mononuclosis. Report of Twelve Cases. *Amer. Jour. Med. Scs.*, vol. CLXXIII, no. 4 (April), 1927, pp. 472-485.
- (23) Needles, Robert J., A Neutrophilic Graph. *Jour. of Lab. and Clin. Med.*, vol. XVII, no. 10, (July) 1932, pp. 962-973.
- (24) McCord, P. M., The Present Status of Benzene (Benzol) Poisoning. *Jour. A.M.A.*, vol. 93, no. 4, pp. 280-283, (July 27) 1929.
- (25) Kracke, Roy M., A Review of Granulocytopenia (Agranulocytosis). *Jour. of Lab. and Clin., Med.*, vol. XVII, no. 10, (July) 1932, pp. 993-1005.
- (26) McHenry, D. D., Vincent's Disease. *Journal of Oklahoma State Med. Assoc.* 20: 221-226, (August) 1927.
- (27) Strong, Richard P., Spirochetal Infections in Man. *The Atlantic Med. Jour.* 29: 507-519, (May) 1926.
- (28) *A Text Book of the Practice of Medicine.* Second Ed. Frederick W. Price. Oxford Med. Pub., p. 476.
- (29) Annual Report Surgeon General, United States Navy for years 1923, 1924, 1925, 1928, 1930, 1931, respectively.
- (30) Reasoner, M. A., and Gill, W. D., The Use of Soap in Prophylaxis of Vincent's Infections. *Jour. A.M.A.* 88: 716, (March 5) 1927.
- (31) Bloodgood, Joseph C., Oral Lesions Due to Vincent's Angina. *Jour. A.M.A.* 88: 1142-1145, (April 9) 1927.
- (32) Mangabeira-Albernaz, P., The Etiology and the Etiologic Treatment of Plant-Vincent's Angina. *The Laryngoscope* 39: 1-15, (January) 1929.
- (33) Mink, O. J., Captain (M.C.), U.S.N., and Campbell, H. D., CPhM, U.S.N., Toxic Effects of Arsenical Compounds Employed in the Treatment of Syphilis in the United States Navy. *The United States Nav. Med. Bul.*, vol. XXXI, no. 2, (April) 1933, pp. 227-228.

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#### LOCAL ANESTHETIC SOLUTIONS

By E. H. TENNENT, Commander, Dental Corps, United States Navy

The science of local anesthesia has undergone remarkable development during the past 20 years, probably as the result of the introduction of procaine. Constant improvement in technique, armamentarium, and anesthetic agents has been a boon to minor and major surgery. Methods of administration have been brought forth to meet the requirements of a broadening field of application, and earnest study has been directed in clinic and laboratory toward perfection of the solutions employed. Unfortunately, misconceptions with respect to the advantages of prepared solutions have been circulated widely and, for this reason, a discussion of the subject of local anesthetic solutions seems timely.

Fischer, Gaza, Brandi, Freeman, Stanly, Nevin, Puterbaugh, Harvey, Benedict, and many others have described the results of

their investigations and experiments in the fields of local anesthesia. In the writings of these men, one finds that attention is given to behavior of procaine and epinephrin under certain conditions; to the stability, acidity, and alkalinity of solutions; to the necessity of a neutral solution; to the possible ill effect of an acid solution on vital tissue; and to the changes brought about in the careless preparation of solutions for injection. All of these are of vital interest to the naval dental surgeon.

Guido Fischer (1) disclosed in an article published in 1928 that he previously had turned his attention to the effects of an alkalized anesthetic solution and noted that his clinical results had improved. There was less irritation to the tissues, increased speed in production of anesthesia and, with freshly prepared solutions, elimination of edema and after-pain. Fischer also found that, upon standing, the toxicity of epinephrin increased in the presence of procaine. Hence, it was less toxic in a freshly prepared solution. He applied a non-anesthetic, high pH solution to painful mouth infections with markedly beneficial results. Fischer also stated his objections to stock solutions because they were shown to be acid and to contain carbon dioxide.

Two other Germans, Gaza and Brandi (2), as far back as 1926-27, showed that an acid solution injected into an inflamed area caused pain, while solutions with a pH of 8.0 could be injected without pain, and that as the acidity of the solution was increased, the pain increased. These same investigators determined that a local acidosis was associated with inflammation.

Some splendid work is being carried on by Koch and Gralnick. They have studied (3) the influence of domestic and foreign commercially prepared solutions, and state that procaine solutions in ampules and carpules will deteriorate; that the adrenalin will deteriorate, with consequent discoloration of the fluid and loss of anesthetic potency. They state that after-pain and local swelling are not uncommon sequelae of infiltration and regional nerve-block anesthesia; and that delayed healing and various degrees of local necrosis frequently occur.

Perhaps the most recent comprehensive study of the whole subject of local anesthesia has been made by Benedict and his coworkers (4). He approaches the subject with discussion of the research that has been carried on by others. Then he takes up the influence of light on anesthetic material; the comparative value of procaine, cocaine, butyn sulphate, and procaine borate; the phenomena of local anesthesia; the pharmacological aspects of local anesthesia; the acidity or alkalinity of various solutions; epinephrin and its functions; buffered solutions; and the chemical study of acid and alkaline solutions on living tissue. This writer forcibly brings out the bene-

fits of an alkalinized solution as compared to one of an acid reaction. While cautioning against an extreme of either, he allows a slight deviation one way or the other, but favors alkalinity.

Some of the salient points of Benedict's article are as follows:

(a) That there exists a qualitative relationship between the pH of the solution and its efficiency.

(b) That procaine borate has a higher pH than procaine hydrochloride.

(c) That procaine hydrochloride without epinephrin in aqueous solution is acid in reaction with a pH of about 5.5, while the procaine borate in aqueous solution is 8.4.

(d) That procaine hydrochloride, which is normally acid, may be made more rapidly effective and satisfactory by the addition of a sufficient alkali to raise the pH to match that of the blood.

(e) That any anesthetic of the procaine type is unstable when combined with epinephrin and cannot be kept in stock solutions.

(f) He reminds us that epinephrin is acid with a pH of 3.3 and when added to procaine, which is already acid, lowers the combination still more.

(g) That unquestionably an alkaline solution is less toxic.

(h) He confirms the interesting fact that the blood does not vary to any extent from its pH when acids or alkalies are introduced; therefore any disturbance must be the result of irritation.

(i) That the limit of range of the pH of a solution should be from 6.4 to 8.4.

(j) That neupercaine is the most toxic of all local anesthetics, with a pH of 6.5.

Harvey, DeFord, and Eller (5), of the Navy, made a comprehensive study of the influence of anesthetic solutions which are acid or alkalinized, and reported comparative findings on the degree of acidity of the various prepared anesthetics which are offered to the profession today in carpules, ampules, etc. They went into the open market and bought tubes, carpules, tablets, instruments, and other material in order to test the constancy of the isotonicity of solutions and to make comparative tests of the acidity of the products of various manufacturers. They determined the degree of hydrogen-ion concentration of each product when ready for injection, and compared the effects when used as intended with the effects when the same products were alkalinized by sodium carbonate. Harvey's article contained much new information and confirmed the findings of other investigators. Among many important facts, it reported that hermetically sealed anesthetic solution of a batch having a certain serial number may not have a constant pH, and that an acid solution when alkalinized with sodium carbonate will not remain alkaline but may turn acid overnight.

Clinical experiments were carried out by injecting a patient on one side of the mouth with an acid solution and on the other side with an alkalinized solution, and it was noted that the alkalinized injection produced anesthesia more rapidly, seemed less painful while injecting, and was devoid of any after effect. There was no tendency to slough, and without knowing why, reinjected patients seemed to lose the dread attendant upon conduction injections. Conversely, it was demonstrated that the more acid the anesthetic solution, the longer the time needed to take effect, and that the incidence of pain was increased.

Nichols (6) in 1920 brought out very forcibly the behavior of red cells in the presence of an unbalanced solution. Briefly, in his experiments he found that a hypotonic solution quickly destroyed red cells by causing swelling; that a hypertonic solution injured red cells by shriveling or contracting the cell wall; and that an isotonic solution had no influence at all on the red cells. He also stressed that a solution greatly differing in temperature from that of the body destroyed the cells, and that muscle and nerve cells were influenced in the same way as those of the blood.

The Council on Dental Therapeutics (7) of the American Dental Association has emphasized the following points regarding stock solutions for local anesthesia:

Stock solutions are not desirable because irritating preservatives are frequently used, and the permanent stability and sterility of such solutions are open to question \* \* \*. The use of anesthetics in carpules and ampules is discouraged because of the acidity. \* \* \* Since epinephrin is only stable in acid solution, any attempt to make a carpule solution alkaline, not only accelerates oxidation of the epinephrin but the whole solution becomes unstable.

The council points out that recent investigators have urged the desirability of using local anesthetic solutions which, in reaction, more nearly approach the human blood and tissues and that such solutions produce a more rapid anesthesia with less tissue injury.

The writer was designated to study and report upon the practicality of the carpule method of obtaining anesthesia. A manufacturer furnished 400 carpules and equipment for use in the determinations, which were continued over a period of about 6 months. A few other dental officers were given carpules and the special syringes for trial in order that I might compare their findings with mine.

A general discussion of observations probably is more interesting than statistics. In the first place, before any local anesthesia should be given, a technique insuring sterility of the armamentarium must be developed. This was the first difficulty encountered. The needles of the special syringe could be boiled, of course, but there was no way of flushing out the inside of the needle—a necessary step because



of the chance of blood or other fluids entering the needle. If the needle were flamed, the residue remained inside and could not be washed out with sterile water as can be done with standard syringes. It was found that one must depend upon phenol or alcohol to disinfect the exposed surface of the rubber stopper of a carpule before puncturing with the needle, and that there is the question of sulphur from the rubber stopper forming other compounds within the contents of the carpule. Next, there arose the question of sterility of the solution within the carpule.

The chemical laboratory reported acidity of the solution of every carpule submitted for examination. In some of the tubes the fluid turned amber color, probably due to oxidation of the epinephrin. In other tubes large mossy-looking substances of the color of iron-rust formed, probably due also to oxidation of epinephrin. About 20 tubes out of the lot became unfit for use. This was a small part of the total number examined, but, considering that the tubes, if adopted by the Navy would have to be stored for varying periods of time before shipment, and even after shipment, it was believed that the risk of deterioration would be great. The manufacturer admitted doubt that the solutions would remain stable in the Tropics. A formula of the prepared solution was submitted by the manufacturer.

A prepared solution may contain preservatives which would act as irritants. There is also considerable likelihood of incorporation of disinfectants. None of the large number of carpules submitted for culture produced evidence of infection.

In observing the clinical effects of the prepared solutions, it must be stated that there was little evidence that the stock solution had directly aggravated conditions. However, by the use of carpule solution in one side of a patient's mouth and a freshly prepared solution of known pH in the other, as Harvey had done, differences in effects could be noted. The side in which the alkalinized solution was used appeared less inflamed, was not sore, and ran an uneventful course in healing; while in the opposite side, where the prepared anesthetic was used, the tissues showed slower improvement and the patient experienced greater discomfort, as a rule. Nearly every patient with whom an alkalinized solution was used, commented upon the very slight discomfort experienced. In oral surgery, where comparatively large amounts of procaine are used, the benefits of an alkalinized solution are markedly noticeable.

As time goes on the manufacturers of prepared solutions are striving to overcome objectionable features, and have done so in a large measure. The chief aim has not yet been accomplished; that is, to produce an anesthetic which matches the hydrogen-ion concentration of human blood and at the same time remains potent.

In the laboratory of the Naval Dental School tests were made, using fresh human blood, and the following reactions were recorded: Seven test tubes were prepared and numbered, and into each tube was put 1 cubic centimeter of blood.

Tube no. 1: Two mils of distilled water was added to 1 mil of fresh blood. The color turned lighter than normal blood. Microscopic examination: Blood cells were almost obliterated, and those that could be seen were swollen.

Tube no. 2: Two mils of a 2-percent procaine-hydrochloride and epinephrin solution was added to 1 mil of fresh blood. The color remained nearly normal.

Tube no. 3: To 1 mil of fresh blood 2 mils of a 2-percent procaine-hydrochloride and epinephrin solution was added after being prepared in the usual way except that the solution was boiled a little longer than usual. The color was a little darker than that of tube no. 5. Microscopic examination: The blood cells were shriveled and crenated. The periphery of each cell looked as though it were a gear wheel.

Tube no. 4: Two mils of a 4-percent solution of a procaine-hydrochloride and epinephrin was added to 1 mil of fresh blood. The color was still a little darker. Microscopic examination: The blood cells appeared as from tube no. 3 (crenated).

Tube no. 5: Two mils of a 2-percent procaine-hydrochloride and epinephrin solution, to which had been added 1 drop of a 2-percent sodium carbonate solution (after Harvey) to 1 mil of fresh blood. The color was more perfect than that of tube no. 2 and was selected as a standard. Microscopic examination: The cells appeared perfectly normal.

Tube no. 6: The contents of 1 tube of prepared anesthetic was added to 1 mil of fresh blood. The color was darker than in tube no. 4, almost a purple. Microscopic examination: The blood cells appeared as in tube no. 3 (crenated).

Tube no. 7: The contents of 1 tube of a prepared anesthetic of a different manufacture was added to 1 mil of fresh blood. The color was a little darker than in tube no. 4. Microscopic examination: The blood cells appeared as in tube no. 3 (crenated).

#### SUMMARY

1. It is known that anesthetic solutions generally are not entirely compatible with the body tissues.

2. Human tissues have a hydrogen-ion concentration of about 7.4 (slightly alkaline).

3. All local anesthetic solutions sold in ampules, carpules, and bottles, etc., are acid in reaction, with a pH of from 3.5 to 6.5, and are not stable.

4. Procaine-hydrochloride and epinephrin tablets do not make a neutral solution, as is generally supposed, but the solution may be neutralized or slightly alkalized by the addition of a 2-percent solution of sodium carbonate.

5. Alkaline solutions are not stable, hence the acidity of anesthetics put up in tubes, carpules, etc.

6. Epinephrin will oxidize in solution, and after certain periods in tablet form.

7. Procaine-hydrochloride ordinarily is acid.

8. The effect upon cellular tissue of an unbalanced anesthetic solution is deleterious, and in many instances productive of pain, edema, and other unnecessary and undesirable conditions.

9. When a neutral or slightly alkaline anesthetic solution is used, anesthesia is more rapidly produced, more profound, less painful, and the tissues heal more rapidly.

10. Anesthetic solutions should have a pH of 7.0 or higher, and should be freshly prepared for each patient.

11. There is a limit of tissue tolerance both to acidity and to alkalinity.

12. The normal buffering action of the blood automatically functions against a slight variation in the hydrogen-ion concentration, but we must not expect this action to prevail against an extreme.

#### REFERENCES

- (1) Fischer; *Klin. Wchnschr.*, No. 7, 1928.
- (2) Von Gaza and Brandt; *Klin. Wchnschr.*, No. 25, 1926.
- (3) Koch and Gralnick; *Dental Items of Interest*, November 1930.
- (4) Benedict, Clark, and Freeman; *J.A.D.A.*, December 1932.
- (5) Harvey, DeFord, and Eller; *Dental Cosmos*, June 1932.
- (6) Nichols; *J.N.D.A.*, February 1922.
- (7) Council on Dental Therapeutics, *J.A.D.A.*, June 1932.

**NOTE.**—The above is a review of selected literature on the subject of anesthetic solutions, and of observations and study by the writer in practical cases in oral surgery, and must not be construed to represent the official opinions of the Navy Department.

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#### ALCOHOLISM AND PELLAGRA

By STEPHEN R. MILLS, Lieutenant Commander, Medical Corps, United States Navy

Twelve cases with pellagrous symptoms were admitted to the wards of the Naval Hospital, League Island, Pa., during summer and fall of 1930. As pellagra is relatively uncommon in this region, the presentation of a few of the case histories with a brief discussion of the common clinical findings seems merited.

## JULY

CASE 1.—Age 48; white; seaman.

Weakness, diarrhea, and eruption on hands and wrists.

No previous admissions. No operations.

Onset was gradual following a winter during which he lived alone in a small cabin. He drank some every day and ate only when he felt like it. For the past 3 months has been on an alcoholic debauch (bootleg alcohol) taking food only occasionally and this almost limited to oatmeal.

Markedly emaciated adult male with a peculiar stare. Mildly demented. Pale with no edema or cyanosis. Muscles flabby and marked loss in weight apparent. Disoriented.

Skin: There is a dry, scaling dermatitis of backs of hands and sharply demarcated at wrists (exposed area).

Eyes: Normal.

Ears: Negative.

Mouth: Tongue swollen, red and papillae prominent. Entire buccal mucous membrane raw, red and bleeding with numerous grayish patches scattered throughout. No teeth present.

Chest: Negative.

Heart: Normal position and size. Sounds distant. No murmurs.

Blood pressure 110/60.

Abdomen: Scaphoid soft. Liver not apparently enlarged. Spleen not palpable. Examination otherwise negative.

Impression: Pellagra and Alcoholism.

Laboratory findings: Urine negative on a number of examinations. Blood hemoglobin, 90; red blood count, 4,590,000; white blood count, 8,800; differential polys, 49; lymphs, 44; trans, 6; L. mono., 1.

Gastric analysis: Total acidity, 15; HCL, none.

Blood chemistry: Normal. Smear from mouth positive for V.A.

This patient had frequent, small liquid stools which were largely mucous. The diarrhea cleared up rapidly under HCL therapy. Yeast, liver, and a pellagra diet were prescribed and under this regimen the patient continued to gain in weight and strength, the mental confusion cleared and he was symptom free in 2 months after admission.

## JULY

CASE 11.—Age, 37; white. Weight loss, 30 pounds in 5 months.

Temperature, 102. Pulse, 120.

Diagnosis: On admission, chronic alcoholism.

Not obtained.

A pale emaciated, disoriented, wild eyed, adult male. Development poor. Muscles flabby.

Skin: There is a dry, scaling dermatitis of hands and wrists (dorsal surface).

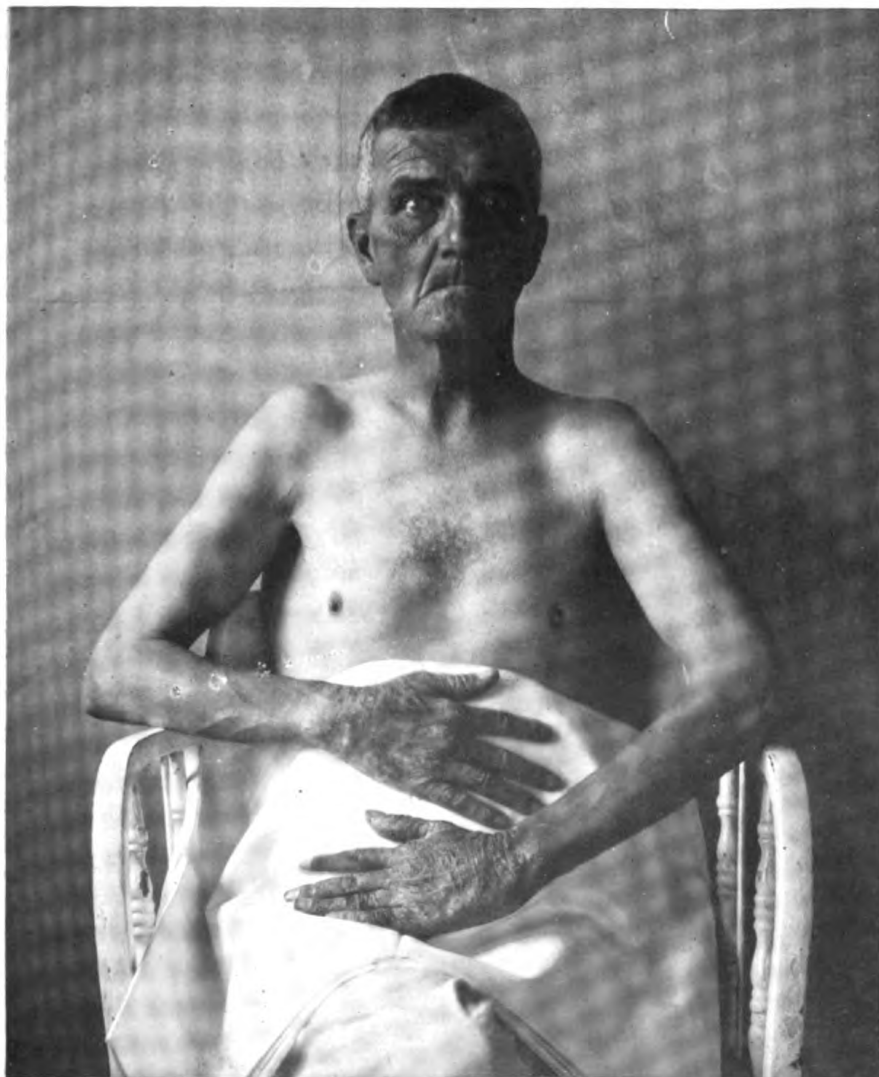
Face: Slightly flushed.

Eyes: Injected, but react to light and accommodation.

Mouth: Tongue raw and swollen. Entire mucous membrane raw and bleeding and covered with grayish patches which when forcibly removed leave a bleeding surface.

Chest: Tactile fremitus increased throughout and scattered coarse rales in both lungs. Transient friction rub over right upper lobe.

Heart: Enlarged to left and downward. Apex beat 6 1 in nipple line. Sounds weak but no murmurs heard. Blood pressure, 130/70.



PELLAGRA CASE SHOWING CHARACTERISTIC RASH.



Reflexes: Exaggerated slightly.

Abdomen; spine; limbs: no abnormality.

Laboratory: Kahn and urine negative. Blood hemoglobin, 95.

White blood count, 10,600. Smear from mouth positive for V.A.

Patient complained of dysphagia. Delirium increased and patient grew weaker. Frequent small incontinent stools were passed and death occurred on fifth day after admission.

#### AUGUST

**CASE 111.**—Age, 34. White. Temperature, pulse, and respiration normal.

Diarrhea and sunburned hands.

Negative.

Onset dates back to spring of this year when he developed diarrhea and a colicky pain in lower abdomen. He had been drinking hard (bootleg liquor) all winter and frequently went without food for days. Two months ago went fishing and sat in the sun with his sleeves rolled up. The next day hands and arms were red, blistered, and swollen. Hands and wrists have been dry and peeling ever since. Was under treatment in June for same complaint and at this time free HCL was absent from gastric juice on several analyses.

Thin adult male. Entirely oriented. Slightly sluggish mentally.

Head: Negative.

Eyes: Pupils equal, react to light and accommodation.

Mouth: Tongue swollen and red, mucous membrane red and angry looking.

Heart: Negative. Blood pressure, 106/62.

Chest: Expansion poor, otherwise negative.

Abdomen: Soft and flabby. Appendectomy scar. Liver three-finger breadths below costal margin. Spleen and kidneys not felt. Hands are dry and scaling. Eruption clearly defined at wrists (fig. 3).

Reflexes: Normal.

Laboratory findings: Urine and Kahn negative. Blood hemoglobin, 90; red blood count, 4,600,000; white blood count, 7,400; polys, 61; lymphs, 34; trans, 2; L. monos, 2; eosin, 1.

Gastric analysis: Total acidity 12. Free HCL none.

The diarrhea subsided, the dermatitis disappeared, and patient gained 18 pounds in 6 weeks of diet augmented by yeast and liver with HCL after meals.

The histories and findings in remaining nine cases are strikingly similar. Four patients of the group died, all within 10 days after admission.

The following were common to all:

1. Alcoholism.
2. Glossitis and angina.
3. Achlorhydria.
4. Enterocolitis and colitis.
5. Dermatitis.
6. Delirium or dementia.
7. Emaciation.

Alcohol as a factor in pellagra has long been an established fact (Cecil-Andrews et al.). In most cases the symptoms followed a long alcoholic debauch with marked limitation of foods. Of inter-

est is the fact that all consumed home-made "corn whisky, synthetic gin, or bootleg whisky."

The appearance of the mouth and tongue was similar in all cases and was considered almost diagnostic.

The tongue was beefy red, swollen, and the papillae enlarged. The entire mucous membrane of the mouth and throat was raw and bleeding in spots from denudation, while scattered throughout were island-like patches of dirty gray color. Secondary Vincent's infection was a constant finding.

Extremely sore mouths were complained of by all patients. Several had marked dysphagia.

Achlorhydria is an almost constant finding in chronic alcoholics. Free HCL was absent in all the above cases whose mouths were not too sore to permit of the test being made.

Angina and glossitis are frequently associated with achlorhydria in the microcytic anemias as well as those of megaloblastic type (Witts, Year Book, 1932). Similar involvement of the mouth is encountered in both sprue and pernicious anemia. Spies and Payne report (Year Book, 1933) that the "intrinsic factor" (proteolytic enzyme of hemopoietic powers) which was shown by Castle to be absent from the gastric secretion of patients with pernicious anemia, is present in the secretion of the pellagrous.

It therefore seems plausible to assume that the glossitis and angina were the direct result of the achlorhydria and dehydration from diarrhea.

Enterocolitis or colitis was a constant symptom. The stools were small, liquid, and varying in number from 3 to 30 daily. The stools consisted of mucous, and in the more severe cases mucous and blood. Bacteriologically they were not unusual. None had the fatty pultaceous stool of sprue.

Persistent lack of free HCL in the gastric juice will, after a time, cause intestinal irritation with a resultant diarrhea. Chronic diarrhea produces dehydration and anemia.

For the most part the dermatitis was symmetrical, dry, and scaly, involving the hands and wrists only. All patients had a ready explanation for this from sunburn to gasoline and grease burns. One blamed a solution of lye which he had used.

Two cases had an accompanying dermatitis exfoliativa of arsenical type and two a generalized dermatitis while under treatment.

There was no so-called "necklace" or involvement of the feet.

Involvement of the central nervous system was a constant finding varying from maniacal delirium to mild dementia (one exception who was mentally sluggish).

These mental symptoms disappeared as recovery took place.



The limitation of food over a considerable period with a persistent diarrhea and the resultant dehydration no doubt is responsible for the marked weight loss in these patients. Weight was regained very slowly.

With one exception there was present a mild secondary anemia without any particular morphological change in the red or white cells. In one fatal case there was a gradually increasing anemia of megaloblastic type with high color index, simulating pernicious anemia.

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**A SYSTEMATIC STUDY OF 303 CASES OF SYPHILIS WITH USE OF A "GRAPH" FOR AID IN COMPREHENSION**

By L. E. McDONALD, Lieutenant (Junior Grade), Medical Corps, United States Navy

The data used in this paper have been collected from the health records and syphilitic abstracts of the enlisted men attached for duty at the United States Naval Air Station, Pensacola, Fla., during the last 19 months. A total of 303 records in which there appears a diagnosis of syphilis has been reviewed here during this period. Of this group 139 remain attached.

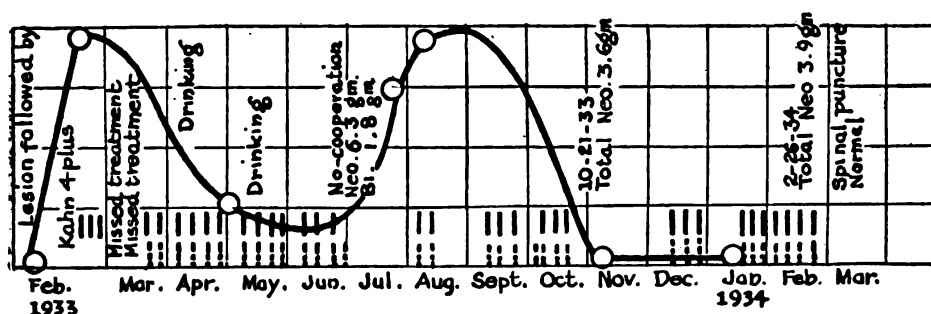
When one attempts to form a mental picture of any given case of syphilis he is most likely to find, after studying the entries in the health record and the abstract, that his impression is a vague, confused one, consisting mostly of the dates courses were begun and completed. There is no mental picture showing the correlation between the serological findings and the courses of treatment. The physician will acquaint himself with the results of the last two or three blood tests without respect to the period of time elapsing between them, and the intervening treatment, and then renders a decision which vitally affects the patient's life. This in the majority of cases will be wrong. In order to facilitate a more thorough understanding of the case the following blank card is suggested for aid in comprehension. When each new case of syphilis arrives at the dispensary a card is filled out from the data obtained from the health record and abstract. The card is self-explanatory, being a replica of the entries in the syphilitic abstract, and needs no discussion except that a curve is plotted on the card using the results of blood tests as points on the curve with their respective dates. This forms a graph, and visualization of any case is easily obtained. This gives all the data found in the health record and in addition shows the correlation of serology, treatment, relapse, both clinical and serological, and aids in forming a better understanding of the case. It is something the patient can also visualize. After this study recommendations are more readily appreciated



4. Finally the information wanted concerning any case is at your finger tips. All the cards are arranged alphabetically and are placed in one of the following sections of the file which remains on the desk of the physician in charge of treatment.

1. Active treatment.
2. Mercury rubs.
3. Blood tests.
4. Rest.
5. Needing treatment.
6. Arrested, no treatment.
7. At hospital, on leave, etc.

What are the objections to this method for aid in comprehension? There are only the faults you find with any system of recording plus the additional objection that it requires too much work. Often as much as an hour will be spent trying to decipher some of the entries in the abstracts in order that they may be transferred properly to the card and in any other system of recording this is not necessary. This does require an additional amount of work, especially when you have a large group under treatment. It seems that the advantage of the card, however, outweighs the disadvantage of requiring extra work for their use.



This card illustrates the effect of behavior and cooperation on the results of treatment. It shows, too, that you are apt to be wrong in predicting what the spinal fluid will show.

#### THE MANNER IN WHICH THE DIAGNOSIS OF SYPHILIS WAS ESTABLISHED IN 303 CASES

With aid of dark field:	Cases
Alone.....	32
With negative Kahn.....	34
With positive Kahn.....	32
Total.....	98
With positive Kahn:	
With history of lesion.....	165
Without history of lesion.....	31
Miscellaneous.....	9
Total.....	205

Later, as we discuss the early diagnosed syphilis, we will refer only to the group that had the diagnosis made before there was a positive Kahn, namely, the group diagnosed by dark field alone, or dark field with negative Kahn. The other group of late diagnosed syphilis will have in it all those cases having a positive blood test.

Referring to the figures we find that a total of 99 were diagnosed early and a total of 205 diagnosed late. This figure (99) for the early diagnosed cases is high and speaks well for the Navy technician and also points with favor to the patient as we shall see later.

#### RELAPSE

We come now to a discussion of that important group of patients who no doubt receive inadequate treatment and the group that constitutes the biggest responsibility in administering treatment at the given moment or in outlining future treatment; namely, that group which have serological relapse alone, or accompanied by clinical relapse. We shall not refer to clinical relapse except to say that I have never seen this entry in the record of any patient having syphilis, and if patients are closely followed often a recurrence of mucous patches or other secondary manifestations will accompany the serological relapse. Clinical relapse is always omitted from the health record, but the result of the Kahn test always entered, which at times has no significance. Serological relapse does not always occur as an indicator of the activity of a syphilitic infection, and because of this fact there is a grave responsibility on the physician recommending treatment. Indeed, one patient came to autopsy here, dying of syphilitic meningitis, who had shown no serological relapse for 7 years and whose blood serum was negative 1 month before death. There has been on this station several cases of clinical relapse without the blood serum becoming positive, and it is sufficient to say that we do not rely too strongly on negative Kahns as a criteria for no more treatment with strong evidence clinically that the infection is progressing, or in view of the fact that the patient has not had sufficient treatment for cure.

In order to simplify a discussion of this problem, we shall consider all treatment under two types:

1. Continuous treatment.
2. Irregular treatment.

By continuous we mean that type of treatment which allows no rest periods between courses of treatment, regardless of number of courses, or number of injections of some form of arsenic in each course.

By irregular we have reference to that type of treatment which is so popular in the Navy, which consists of injections of 6 or 8 followed by periods of rest, subsequently another course.

## CLASSIFICATION OF 303 CASES OF SYPHILIS ACCORDING TO TYPE OF TREATMENT

Continuous treatment: Total, 102; total relapse, 11.

Irregular treatment: Total, 201; total relapse, 66.

We have not included supplemental treatment with mercury, bismuth, and the iodides. When one attempts to collect accurate data concerning these compounds the reason is obvious. Some of the entries in the syphilitic abstract are so vague that the person recording the treatment could not decipher the quantities administered. Often there are no dates given, no amounts stated, and at times I have had the patient tell me that he did not have bismuth but mercury, even when the entry in the abstract is bismuth. In regard to mercury rubs, everyone knows that even under supervision it is difficult to give a patient a therapeutic amount, and even though he lacks this quantity it will be recorded in the health record as a full dose. It was considered unwise to use this data.

Of a total of 303 cases, 226 cases did not relapse, and 77 did relapse: 25.4 percent did relapse, and 74.6 percent did not relapse. Regarding the two types of treatment we find that 32.9 percent relapsed under irregular form of treatment and that 10.7 percent relapsed under the continuous form.

The average number of injections in each course of those treated continuously is 10.2 against 7.4 treated irregularly. This is an average of 2.8 injections per course more and may possibly explain the favorable results seen in those treated continuously. What is another explanation? The average number of injections necessary to give a patient their first negative Kahn, if not Kahn positive throughout the whole period, regardless of how diagnosis was made early or late, and regardless of the period of time intervening, you arrive with the figure 14.1 injections. Strangely enough this figure in those 77 cases showing serological relapse is 11.1, which is a higher figure than those who did not relapse and their average was 10.2 for those treated continuously and 7.4 treated irregularly. In those patients treated continuously you closely approximate the average number of 14.1 injections which gives on an average the first negative Kahn. This will also explain why you have fewer relapses in this group.

What is the average number of months elapsing from the date of diagnosis until their first negative Kahn, if not Kahn positive throughout, omitting whether diagnosis was made early or late, and regardless of the amount of treatment given in the period? The average period elapsing is 8.4 months. We shall presently show in an analysis of the 77 cases that relapsed that the greater number relapse during the first 12 months of their infection. Then the

first year becomes an important period in the life of a patient infected with the spirochete pallida. Treatment continuously during this period certainly offers maximum results.

Serological relapse occurred during the first year in greater percentage in both cases diagnosed early and those diagnosed late. There is a subsequent rise in the fifth year of those diagnosed late. This will be discussed at a point later in the paper.

The following advantages have been received by the patients treated continuously as shown by the data collected.

1. He has received more injections of arsenic per course.
2. Even in the first course he has approached the average number of injections found to give the first negative Kahn in 303 cases, namely 14.1 injections as against an average of 10.2.
3. He has received more treatment during this first important year, with no rest intervals.
4. He has avoided relapse after 5 years.

In this group of 48 patients there are none who did not have an early diagnosis. The significant data collected in this group is given in this table.

*48 patients who never developed a positive Kahn*

Period	Continu- ous	Irregular	Period	Continu- ous	Irregular
Less 12 months.....	11	0	60 to 72 months.....	0	3
12 to 24 months.....	6	3	72 to 84 months.....	0	2
24 to 36 months.....	5	3	84 months and up.....	2	3
36 to 48 months.....	1	4			
48 to 60 months.....	2	3	Total.....	27	21

Average total number of injections in 27 continuous.....	15
Average total number of injections in 21 irregular.....	27
Average number of injections of those treated less than 12 months continuous treatment.....	12.9
Average number of injections of those treated irregularly 12- to 24-month period.....	10.1

In this group of 48 patients we find that 27 were treated continuously and 21 were treated irregularly and none developed a positive Kahn. We find, too, that the majority of cases are in the period under 1 year and too much significance cannot be placed on this group. The average total number of injections in this group under 1 year is 12.9, which is a very low figure. In the next group, 12-24 months, the average is even lower as most cases treated continuously will require little treatment during the second year. The average for the group treated irregularly is 10.1. If you take only the cases over 1 year of age and average the total number of injections you find that even then the irregular cases have received more treatment than those treated continuously. This apparently shows that if syphilis is diagnosed early any form of treatment will cure in the majority of cases, especially if in the first course you approach the

number of injections necessary to produce the first negative Kahn, namely, 14.1 injections.

Having then followed through 226 cases which did not have a serological relapse, and 48 cases which did not develop a positive Kahn, we come to a discussion of the remaining 77 cases which did have a relapse.

#### 77 CASES OF SEROLOGICAL RELAPSE

First we shall divide the group into two divisions, those who had an early diagnosis and those who had a late diagnosis.

	<i>Cases</i>
Early diagnosis.....	99
Relapse .....	11
Late diagnosis.....	205
Relapse .....	66

What is the period of the infection in which this group had their relapse?

	Early diag- nosis	Late diag- nosis
Under 1 year.....	5	21
Under 2 years.....	4	14
Under 3 years.....	2	12
Under 4 years.....	0	6
Over 5 years.....	0	13
Total .....	11	66

The importance of early diagnosis is apparent if you will observe the trend of the curve in the early diagnosed cases which is distinctly toward the base line and the trend in the late diagnosed cases, which shows an upward swing after 5 years.

We find from an actual study of this group that 34 out of 77 cases received only enough treatment to give them their first negative Kahn, and that the average number of injections in these 34 cases was 11.1. This figure is lower than the one found in the whole group of 303, which was 14.1.

#### Summary

Total relapsed.....	77
No treatment after first negative.....	34
Number receiving less than 11.1 injections.....	12
Number receiving more than 11.1 injections.....	65

Returning to our original large number of 14.1 injections for the production of the first negative Kahn, we can say that 12 did not receive the treatment necessary for the average to produce a negative Kahn. Likewise we may say that the average in this group was 11.1 contrasted against 14.1 for the entire 303.

From a study of the health records it may be said that the period of time necessary under intensive treatment to render a serum negative for the first time after diagnosis is made in the group diagnosed late varies indeed. I have treated one case 7 months intensively without a reduction in serology. Again, too, there are cases that reverse their serology without any treatment at all occurring during a rest period.

A discussion of treatment in this group is difficult because there were 12 who had less than 11.1 injections, and all of these except 1 were in one continuous course. The remaining were treated irregularly except 11 cases. If we discard the 12 who received less than 11.1 injections of the 77 cases we have 65 remaining, of which 11 were treated continuously yet relapsed and 54 were treated irregularly and relapsed.

Treatment does have a different effect on those cases diagnosed early and those late. We find that only 11 cases of the early diagnosed relapsed and 4 of these were treated continuously contrasted with 7 treated irregularly. In the late group we find only 9 cases treated continuously and 57 cases treated irregularly.

Again we reach the same conclusion that continuous treatment early offers maximum results and the cases treated in this manner show fewer serological relapses.

#### WHAT WILL THE SPINAL FLUID SHOW IN THESE 77 CASES OF SEROLOGICAL RELAPSE?

Everyone knows the difficulty in finding the patient in the mood for a spinal puncture. He must be shown the advantages of studying his spinal fluid and then given time to reach a decision. Some do not follow the advice and are reluctant to go through with this procedure, however, some are eager. We have observed that the younger the patient the more willing he is and this is exactly opposite our desire as the late syphilis is in the older men. All spinal punctures have been done in the dispensary and no bad results have followed except occasionally a postpuncture headache arises.

Total number of spinal punctures.....	39
Normal findings.....	19
Abnormal findings.....	20

Seventeen punctures were made in the group who had at some time a serological relapse. Ten of these cases had abnormal fluids, and 7 had normal fluids.

Many significant conclusions may be reached from these findings.

1. That more than 50 percent of the cases studied showed abnormal findings.



2. In the early diagnosed group of 11 cases 2 were positive. In the late diagnosed group 10 were positive.

3. That eight cases were positive in whom there was no serological relapse and a negative Kahn at the time of the puncture.

4. That it is impossible to predict the findings of the spinal fluid in any case.

Investigation of other cases is desired, especially in the group that relapsed, but some of the difficulties have been enumerated above. There are cases that have had as many as three punctures, and gradually the fear from such a procedure is subsiding, and it may be possible that eventually we will have the findings on all of this group. This information would be most interesting. Of all our diagnostic procedures spinal puncture is the most neglected. It is a medical curiosity to find an entry of a spinal fluid analysis in the record of patients known to have serological relapses, and in this group it is most important. Often on this simple procedure a patient's life may be saved from the ravages of late syphilis.

#### SUMMARY

1. Three hundred and three cases of syphilis have been investigated with reference to:

A. Manner of diagnosis.

Early.

Late.

B. Age of infection.

C. Manner of treatment.

Continuous.

Irregular.

D. Clinical and serological relapse.

E. Those showing no positive Kahns.

F. Those showing no relapses.

G. Study of the spinal fluid.

#### CONCLUSIONS

1. That a clear mental picture of any case of syphilis is difficult to form from a study of the health record and the syphilitic abstract. By the simple use of the card suggested and illustrated any case becomes comprehensible.

2. That an early diagnosis before there is a positive Kahn is much desired. Apparently little treatment during this period will cure, contrary to the modern thought as to the amount of treatment necessary for cure.

3. That continuous treatment early is much desired to the irregular "Navy type" treatment.

4. Serological and clinical relapse may occur together or separate. These appear less in patients treated continuously.
  5. That there is gross neglect in the study of the spinal fluid in patients known to have had syphilis.
  6. That more attention should be given to the proper entries of treatment in the syphilitic abstract in order that they may be of value as an accurate concise record.
  7. That the important year of the luetic is the first year, proper management of his treatment during this year offers his best guaranty of permanent cure.
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#### A PLEA FOR ADEQUATE ANTISYPHILITIC TREATMENT

By G. H. EKBLAD, Lieutenant (Junior Grade), Medical Corps, United States Navy

Treatment of syphilitics should be on a high standard in the naval service. The medical officer always has at hand a permanent record of the date the disease was contracted, Kahn or Wassermann reactions, and treatment given. The patient is practically always available.

It is strange, then, on checking over syphilitic records, to note the inadequate treatment the majority of patients receive. It is not uncommon to find records in which all treatment has been dropped upon transfer of the patient to another station, in spite of the fact that he has received only one short antiluetic course or less. It seems to be a rule in a number of cases that if they run one or two negative blood tests, all treatment is stopped, regardless of the adequacy or inadequacy of previous treatment.

A negative blood test alone is a totally unreliable criterion by which to gauge treatment. This is self-evident from the number of negative bloods which revert to positive, and from the fact that 40 percent of patients with luetic cardiovascular complications have negative bloods on the first examination, and 30 percent never show a positive blood in spite of repeated, and provocative, tests. Wassermann reactions in neurosyphilitics in general are negative in 25 to 40 percent of cases. (All figures from Stokes—Modern Clinical Syphilology.)

Syphilitic records on board the U.S.S. *Wyoming* were examined and treatment tabulated below. There are 131 syphilitic abstracts, of which 17 are prior to 1925 and were not tabulated. The following table is intended to give a cross section of antiluetic treatment in the naval service. For this reason, in order that the work of a few men would not unduly influence the series, the records of cases contracted in 1932 and 1933 were not tabulated, as 38 of 45 of these cases were diagnosed, and subsequent treatment largely in

control of, medical officers of the U.S.S. *Wyoming*. For the same reason, three records of 1931, which were diagnosed on the U.S.S. *Wyoming*, were not tabulated. One case in 1930 diagnosed on the U.S.S. *Wyoming* is tabulated. This leaves a total of 66 cases recorded. While the number is not large, it nevertheless represents men coming from stations and ships of the entire service and should give a representative survey of antiluetic treatment in the Navy.

A study of these records reveals the following: Of 13 cases in 1925, 1926, and 1927, not one received adequate treatment. Six received only eight injections or less of arsenicals the first year. Not a single case received any treatment in the second year. Only six received any treatment after the first year, and this after a negative blood had become positive. Eight blood reactions which had been negative became positive after the first year.

There are 11 cases in the 1928 year group. There is a marked improvement in the treatment of this group, all cases receiving 8 or more, and 7 cases receiving 16 or more, injections of arsenicals in the first year. Six received no treatment the second year, and 1 only 3 neoarsphenamine injections. Four received no treatment after the first year, and 1 received 4 injections of neoarsphenamine in his fifth year. Three bloods reverted to positive after the first year.

There are 13 cases in the 1929 year group. Twelve received 8 or more, and 8 received 16 or more, injections of arsenicals the first year. Subsequent treatment, while poor, is much better than that of the earlier groups. Only five received treatment in the second year. Four received no treatment after the first year. Three bloods reverted to positive after the first year.

There are 16 cases in the 1930 year group. This group shows still further improvement in treatment, particularly of the first year, 13 cases receiving 16 or more injections of arsenicals the first year. However, in the second year, 8 received no treatment, and 1 received only 3 injections of neoarsphenamine. Three received no treatment after the first year. Three had blood tests revert to positive after the first year.

There are 13 cases in the 1931 year group. The treatment of the first year was not as good as in the 1930 group, but subsequent treatment was considerably better. Six received 16 or more injections of arsenicals the first year, and 9 received 12 or more. Eight received 12 or more injections the second year.

From the above, together with a study of the following table, it can readily be seen that syphilitic patients in the past have not received the treatment they should have. A ray of encouragement is the marked improvement shown in the later years.

With a number of medical officers handling the same patient from time to time, a routine standard of treatment is out of the question.

This is immaterial as long as good and sufficient treatment is given. The patient is probably better off, receiving the benefits of different methods of attack.

The following outline of treatment is followed on the U.S.S. *Wyoming*. A minimum of 5 courses is required, each course consisting of 12 weekly intravenous injections of 0.6 gm each of neoarsphenamine, supplemented with 12 weekly intramuscular injections of bismuth or mercury, and followed by 4 weeks of mercury inunctions and potassium iodid by mouth. The first three neoarsphenamine injections of the first course are given every other day. The rest period between courses is usually 1 month.

No attempt was made to list the various forms of arsenicals given, as very few of the records state definitely what form was used.

If records showed a range in the Kahn or Wassermann reactions in the same year, only the highest and the lowest results are given, and in the order they occurred.

Treatment in each case is recorded in years, to the nearest year, from the date the diagnosis of syphilis was made.

#### KEY TO TABLE

Ar=Arsenicals, intravenous injections  
 Hg=Mercury salts, intramuscular injections.  
 Bis=Bismuth, intramuscular injections.  
 HgR=Inunctions of mercury.  
 KI=Potassium iodid by mouth (in weeks).  
 ++=Two plus, Kahn or Wassermann reactions + =One plus, etc.  
 Neg=Negative, Kahn or Wassermann reactions (see note 2).

	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh and eighth year
1. 1925	Ar. 8 Hg. R. 30 ++++	Neg.			Neg.	Neg.	Neg.
2.	Ar. 3 Bis. 8 Neg.						Neg.
3. 1926	Ar. 14 ++		Neg.	Neg.	+		Neg.
4.	Ar. 12 Hg. 22 ++++	Neg.		Neg.		Ar. 10 Bis. 15 ++	Neg.
5.	Ar. 24 Hg. 18 Neg.	Neg.	Neg.			Neg.	Neg.
6.	Ar. 14 ++++ Neg.	++++ Neg.	Ar. 10 Neg.	Ar. 5 Neg.	Neg.	Neg.	Neg.
7.	Ar. 8 Hg. R. 40 Neg.			Neg.		Neg.	Neg.
8.	Ar. 8 Hg. 7 ++++	Neg.	Ar. 4 Hg. 3	Neg.			Ar. 7 Bis. 8 ++++ (3x)

	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh and eighth year
1927							
9.....	Ar. 16 Hg. 20		Ar. 8 Hg. R. 40 K. I. 9wk. Neg. & +	Neg.		Neg.	Neg.
10.....	Ar. 20 Hg. 12 ++++ Neg.	Neg.	Ar. 12 Hg. 18 Neg. ++++	Neg.			Neg.
11.....	Ar. 5 K. I. 4wk.			Neg.		Neg.	Neg.
12.....	Ar. 25 Hg. 42	Neg.	Ar. 20 Bis. 8 Hg. 42 Hg. R. 20 ++++		Neg.	Bis. 8	Neg.
13.....	Ar. 4 Hg. 6 +		Neg.		+		Neg.
1928							
14.....	Ar. 15 Hg. 6 Neg. & +	Neg.			Neg.		
15.....	Ar. 26 Bis. 30 Hg. R. 20 Neg.	Neg.	Neg.	Neg.	Neg.		
16.....	Ar. 24 ++++	Ar. 10 Hg. 6 Neg.	Ar. 7 Hg. 6	Neg.	Neg.		
17.....	Ar. 20 Hg. 30 ++++& +	Neg.	Neg.		Ar. 4	Neg.	
18.....	Ar. 25 Hg. 6 Hg. R. 60 ++++ Neg.	Ar. 9 Hg. 9 ++++	Ar. 9 Bis. 12 Hg. R. 80 ++++		Ar. 26 Bis. 24 +		
19.....	Ar. 22 Bis. 12 Hg. 6 K. I. 4wk. ++++& ++	Neg.	Neg.	Neg.		Neg.	
20.....	Ar. 8 Hg. R. 30 ++++ Neg.	Neg.		Neg.	Neg.		
21.....	Ar. 13 Hg. 14 Neg.	Ar. 3		Ar. 10 Bis. 10 Neg.	Neg.		
22.....	Ar. 17 Hg. 16 ++++	Ar. 18 Hg. 10 +++ Neg.	Ar. 8 Hg. 8	Neg.	Neg.		
23.....	Ar. 8 Hg. 10 ++++	Ar. 8 Hg. 8 Neg. & +		Ar. 11 Bis. 20	Ar. 10 Bis. 20 Neg.		
24.....	Ar. 19 Hg. R. 49 K. I. 4 wk. ++++ Neg.		Bis. 12 ++++	Ar. 24 Hg. 12 Bis. 10 ++++	Ar. 12 Bis. 24 ++		

	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh and eighth year
1929							
25.....	Ar. 16 Hg. 8  ++++ ++		Neg.	Ar. 12 Bis. 11 Hg. 7 HgR. 10 KI. 2wk. +			
26.....	Ar. 12 Hg. 45 Bis. 5 ++++ Neg.	Neg.	Neg.	Neg.			
27.....	Ar. 40 Bis. 16 HgR. 30  ++++ Neg.	Neg.	Neg.	Ar. 12 Bis. 8 Hg. 6 HgR. 10 KI. 2wk. Neg.			
28.....	Ar. 16 Bis. 10 HgR. 20 ++++ Neg.	Ar. 9 HgR. 35	Ar. 4 Bis. 9	Ar. 6 Bis. 8  Neg.			
29.....	Ar. 8 HgR. 30  ++++ Neg.	Ar. 16 HgR. 30 KI. 4wk.		Ar. 12 Bis. 7 Hg. 7 HgR. 10 KI. 2wk. Neg.			
30.....	Ar. 28 Bis. 20 KI. 4wk. ++++ +		Ar. 16 HgR. 45 KI. 4wk.  ++++	Ar. 12 Bis. 16 Hg. 6 HgR. 10 KI. 2wk. ++			
31.....	Ar. 16 Hg. 16  Neg.	Ar. 8 Hg. 9 Bis. 4 Neg.	Ar. 10 Hg. 6 Bis. 5 Neg.	Ar. 3 Bis. 3  Neg.			
32.....	Ar. 8 Hg. 8 ++ Neg.	Ar. 9 HgR. 80  Neg.	Neg.	Neg.			
33.....	Ar. 16 Bis. 17  ++& Neg.	Ar. 18 Bis. 18 HgR. 50 ++& Neg.	Ar. 7 Bis. 3  Neg.	Neg.			
34.....	Ar. 5 HgR. 30 Neg.	Neg.	Neg.	Neg.			
35.....	Ar. 24 Bis. 10 HgR. 35 ++++ Neg.		Ar. 10 Hg. 8	Ar. 4 Hg. 5  ++++			
36.....	Ar. 18 Hg. 17 ++++ Neg.	Neg.	Neg.	Neg.	Neg.		
37.....	Ar. 15 HgR. 25 ++ Neg.		Neg.				

	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh and eighth year
1930							
38.....	Ar. 16 Bis. 11 Hg. 10 ++++ ++	Ar. 16 Bis. 11  Neg.	Ar. 7 Bis. 3  Neg.				
39.....	Ar. 21 Bis. 9 Hg. 20 ++++ Neg.	Ar. 8 Hg. 8  Neg.	  Neg.	Ar. 3 Bis. 3  Neg.			
40.....	Ar. 16 Hg. 32  Neg.	Ar. 12 Hg. 10	Ar. 12 Bis. 7 Hg. 7 HgR. 10 Kl. 2wk. Neg.				
41.....	Ar. 8 Bis. 8 Hg. 5 HgR. 8 Neg.	  Neg.	Ar. 34 Bis. 26  Neg.				
42.....	Ar. 16 HgR. 110  Neg.	Ar. 10 Hg. 22  ++& Neg.	Ar. 13 Hg. 16 Bis. 16 Neg.				
43.....	Ar. 4 Kl. 2wk.  ++++ Neg.		Ar. 31 Hg. 15 Bis. 20 ++++ Neg.				
44.....	Ar. 11 Bis. 26 +++& Neg.	Ar. 3  Neg.	Ar. 3 Bis. 3 Neg.				
45.....	Ar. 20 HgR. 100 Kl. 4wk. ++++ Neg.	  Neg.	Ar. 3 Bis. 3				
46.....	Ar. 20 Hg. 20  ++++	Ar. 19 Hg. 15	Ar. 12 Bis. 18 HgR. 20 Kl. 4wk Neg.				
47.....	Ar. 30 Bis. 28 Hg. 30 ++++ Neg.	  Neg.	Ar. 3 Bis. 3  Neg.				
48.....	Ar. 17 Hg. 8 ++	  Neg.		Neg.			
49.....	Ar. 16 HgR. 85 ++++ Neg.	  Neg.	  Neg.	Neg.			
50.....	Ar. 20 Hg. 12 HgR. 80  Neg.		Ar. 36 Bis. 45 Hg. 4 HgR. 10 Kl. 2wk. ++++ +				

	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh and eighth year
1930							
51.-----	Ar. 18 Bis. 10 Hg. 12 ++++ Neg.	Neg.	Neg.				
52.-----	Ar. 16 Hg. 4 ++++ Neg.	Ar. 14 Bis. 25	Neg.	Ar. 2 Bis. 3			
53.-----	Ar. 29 Hg. 4 HgR. 20  ++++	Ar. 9 Bis. 36 HgR. 20  ++++ +	Ar. 20 Bis. 29 Hg. 5 HgR. 10 KI. 2wk.  +				
1931							
54.-----	Ar. 28 Bis. 60  ++&Neg.	Ar. 12 Bis. 9 HgR. 16 Hg. 6 KI. 2wk. Neg.					
55.-----	Ar. 13 Bis. 26  +&Neg.	Neg.	Ar. 12 Bis. 5 Hg. 7 Neg.				
56.-----	Ar. 4 Bis. 5  ++++	Ar. 6 Bis. 6 KI. 4wk.  ++++ Neg.	Ar. 14 Bis. 19 Hg. 6 HgR. 10 KI. 2 wk. Neg.				
57.-----	Ar. 18 Bis. 24  ++++	Ar. 12 Bis. 10 Hg. 6 HgR. 10 KI. 2wk. Neg.					
58.-----	Ar. 16 Bis. 7 ++++ Neg.	Ar. 24 Bis. 40 ++++ Neg.					
59.-----	Ar. 17 Bis. 18 KI. 2wk. ++++ +	Ar. 12 HgR. 15  Neg.					
60.-----	Ar. 24 Hg. 35  +	Ar. 12 Bis. 17 HgR. 10 KI. 2wk. Neg.					
61.-----	Ar. 5 Bis. 4 Hg. 12		Ar. 12 Bis. 15 HgR. 10 KI. 2wk. Neg.				
62.-----	Ar. 10 Bis. 31 Hg. 42 ++++	Ar. 15 Bis. 5  ++++	Ar. 12 Bis. 9  +				
63.-----	Ar. 24 Bis. 35  ++&Neg.	Ar. 12 Bis. 18 HgR. 10					



	First year	Second year	Third year	Fourth year	Fifth year	Sixth year	Seventh and eighth year
1926							
64-----	Ar. 9 Bis. 9 ++++	Ar. 10 Neg.	Ar. 3 Bis. 4 Neg.				
65-----	Ar. 14 HgR. 6 +++ Neg.	Ar. 9 Hg. 15 Neg.					
66-----	Ar. 14 Bis. 16  Neg.	Ar. 12 Bis. 15 Hg. 6 HgR. 10 Kl. 2wk. Neg.					



## CLINICAL NOTES

### GUNSHOT WOUND OF THE HEAD<sup>1</sup>

By FRANK B. URBAN, Lieutenant (Junior Grade), Medical Corps, United States Navy

E.E.N., seaman first class, United States Navy, was admitted to the Norfolk Naval Hospital, Portsmouth, Va., January 5, 1933, in an unconscious state, with a gunshot wound of the head. The pulse was of good volume and regular; respiration 22; blood pressure 126/78; temperature 99° F.

There was a punctured wound of the forehead 4.5 centimeters above the left supraorbital ridge, 2.5 centimeters left of the midline. The pupils were unequal, the left being twice as large as the right. Both pupils reacted to light. There was a spastic paralysis of the left side of the face, with hyperesthesia, and a spastic paralysis of the right upper and right lower extremities. Examination of the reflexes revealed hyperactivity of the right upper and right lower extremities. There was a sustained ankle clonus on the right side and the Babinski reflex was positive on that side. There was no evidence of powder burns. The physical examination was otherwise essentially negative. The blood Kahn test was one plus; the urinalysis was negative; the blood picture was as follows: RBC, 4,040,000; WBC, 13,800; Hb, 82 percent; color index, 0.9; juveniles, 1 percent; bands, 8 percent; segmented, 78 percent; lymphocytes, 12 percent; and Eosinophiles, 1 percent.

A radiographic examination of the skull revealed the following findings: There is an irregular, stellate, depressed fracture in the left frontal area, the area involved being about 1½ by 2 centimeters to the left of the midline with the lower margin 3 centimeters above the supraorbital ridge. There are multiple small metallic fragments in the depressed area of bone and just inside the inner table. There is a segment of the inner table lying inside the skull, this segment measuring about 2 by 2 centimeters. There are several very small fragments of bone in the same area, and about 1 centimeter below the level of the fracture and 3 centimeters from the internal plate of the left frontal bone there is an irregular foreign body, of less density than bone. Extending backward through the brain on the left side from the fracture area there is a series of very small metallic fragments. Extending from the fracture area to the parieto-frontal suture there is a triangular area of increased density, probably due to hemorrhage. Lying within the posterior fossa of the skull, just anterior to the internal plate of the occipital bone, 2 centimeters medial to the left parieto-occipital suture and 1 centimeter below the lambda, there is a large metallic fragment, about 1 by 8/12 by 5/10 centimeter. Above this large metallic fragment, and lying against the left parieto-occipital suture there is a sliver of metal about ½ centimeter in length.

The path of the missile can be fairly well visualized due to the minute metallic fragments which extend in a straight line from the point of entry

<sup>1</sup> Report of a case with intracranial damage with recovery. Bullet not removed.

to a point above the missile on the left parieto-occipital suture. Apparently the bullet hit this area, leaving a metallic sliver on the left parieto-occipital suture, and glancing off, and downward, lodging in its present location.

On the day of his admission to the hospital the patient was given 1,500 units of tetanus antitoxin, and 4 ounces of magnesium sulphate by rectum preceded by a soapsuds enema.

On January 6 the patient developed an ecchymosis of the tissues about the left eye with partial closure of the eye. Boric-acid eyewash was prescribed, followed by silvol drops in the eye. There was incontinence of the bowels and bladder. The temperature was 100.2° F.; pulse rate, 85; respiration normal; blood pressure, 120/70. The patient was still unconscious, but moved slightly while being examined. There was a facial paralysis on the left side, with hyperesthesia, the patient portraying pain when the left side of his face was touched. A rubber drain was inserted into the wound of the forehead.

On January 7 the patient was given 2 ounces magnesium sulphate by rectum. Liquid feedings were forced. The temperature ranged from 98° to 99.6° F.; pulse, 57 to 60; respiration normal. The blood picture revealed WBC 16,400, polys, 93, lymphs. 7. An eye-ground examination revealed a beginning choked disk, blood pressure 110/70.

On January 10 the rubber drain was removed from the wound in the forehead. The bowels and bladder were still involuntary. The pulse rate ranged between 54 and 70. The blood picture showed WBC 20,200, juv. 5 percent, bands 13 percent, segs. 74, lymphs. 7, basophiles 1.

The blood picture on January 11 was WBC 14,650, juv. 2, bands 11, segs. 69, lymphs. 18.

At one reading on January 12 the pulse rate was 50, and the temperature was 100.6° F.; blood pressure, 114/68.

The blood picture on January 13 showed WBC 15,150, juv. 2, bands 9, segs. 79, lymphs. 7, basos. 1, monos. 2.

The pulse rate ranged between 56 and 70 on January 14 and the blood pressure was 120/60. Although the papillitis remained about the same, the patient showed some improvement, becoming semiconscious. The wound in the forehead healed nicely.

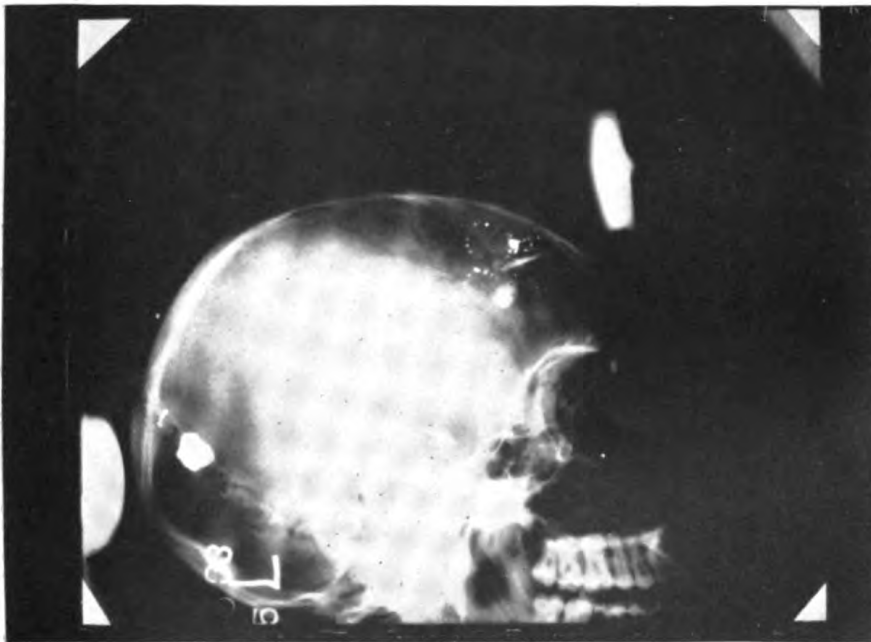
January 16: The temperature ranged between 97° and 98.2° F. The pulse was 65, respiration 20. The papillitis increased, 2-3 diopter elevation. The blood picture on this date was WBC 12,450, bands 6, segs. 76, lymphs. 11, eosin. 1, baso. 1, monos. 5.

Although the patient is still unable to talk, his condition shows appreciable improvement. The recovery of the use of the right lower extremity is noticeable.

From January 17 to 23 the temperature ranged between 97° and 98° F. by axilla; pulse between 70 and 82. The use of his right-lower extremity improved progressively, and the facial paralysis gradually disappeared, the hyperesthesia still being present. At times the patient was allowed up in a wheel chair.

The following day, upon being asked, the patient proved able to print his name with his left hand; and he was put on soft diet this day. The papillitis resolving revealed 1-1.5 diopter elevation with less venous congestion. The blood picture: WBC 12,200, polys. 76. The temperature was 99° F.; pulse 80 and respiration 18. With great effort and hesitation the patient could say simple words such as "yes" and "no", and he also began to regain control of his bladder and bowels.

On January 26 a radiographic examination of the skull revealed no appreciable change as compared with the examination of January 5.



GUNSHOT FRACTURE OF SKULL.



With the aid of an attendant the patient walked a short distance on January 27, and his speech continued to improve. Only a very slight residual of his left-sided facial paralysis remained.

By January 30 the facial paralysis had almost disappeared, and the patient exhibited a marked general improvement. However, he began to complain of frontal headaches on this day. The temperature was 99° F.; pulse rate ranged between 75 and 90. The WBC was 10,200, and the Kahn test was one plus.

On February 8 the patient complained of fleeting blindness of the left eye. He stated that at times his vision was normal, but at other times he was unable to see objects 10 feet ahead. This complaint continued for several days, gradually subsiding, and disappeared entirely in about 2 weeks with resultant normal vision.

By February 15 the hyperesthesia of the left side of the face had entirely disappeared, and only a slight residual paralysis remained.

Reference is here directed to the splendid articles by Capt. Lucius W. Johnson, Medical Corps, United States Navy, on Severe Head Injuries in the July issue of the United States Naval Medical Bulletin 1933. This case was treated similarly to the conservative treatment in Captain Johnson's article.

The physical examination on July 20, 1933, revealed the following findings:

*Head.*—Healed scar at point of entrance of bullet. Very slight residual facial paralysis, and no hyperesthesia. Vision normal, with right pupil contracted.

*Extremities.*—Spastic paralysis of right arm. Spasticity on passive extension of right arm, hand and fingers.

*Reflexes.*—Right patellar exaggerated; left normal. Position, tactile and pressure sense normal on either side of both lower and upper extremities. All the reflexes of the right arm are exaggerated. Sustained ankle clonus exists on the right side. Cremasteric and abdominal reflexes are absent on the right side.

The right shoulder is approximately 1½ inches lower than the left. There is an atrophy of the muscles of both lower and upper extremities on the right side, averaging about 1 inch less in circumference than the left side at various levels.

Patient has been discharged from the service on recommendation by board of medical survey and as far as is known is living today.

*Speech.*—Patient's resultant speech was of a hesitant, and stuttering type but easily understood and slightly decreased normal rate.

Bullet was a .32 caliber type revolver.

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#### A CASE OF ENDEMIC TYPHUS OR BRILL'S DISEASE IN THE PHILIPPINE ISLANDS

By WILLIAM H. FUNK, Lieutenant Commander, Medical Corps, United States Navy

Mrs. J. J. W., age 24, American, wife of a chief petty officer living a short distance outside the United States Naval Hospital Reservation, Canacao, P.I., was suddenly taken sick in the evening with severe sharp persistent nonradiating pain in the lower lumbar region. The pain was so severe that the patient could hardly submit to routine physical examination, which was negative as were the tem-

perature and pulse. A hypodermic of morphine was required to give relief.

The next morning the temperature was 102°, pulse 120, respiration 24, with the only symptom a quite severe headache intensified by any movements. For the next 4 days the temperature swung from a mean low of 99° at noon to a rise of 102° to 104° in the early morning and late afternoon. During this period there would be one or two chills a day corresponding to the temperature rises. The white blood count on these days ranged from 4,100 to 5,350 with the polys. from 68 to 82 percent and all smears negative for malarial organisms.

On the sixth day of the disease an erythematous macular rash was noted on the body and extremities. The rash never became petechial and faded in about 5 days' time. With the onset of the rash there were no more chills, but the temperature remained up, reaching 104 quite a few afternoons. The patient was quite toxic with a pulse of over 100. The headache was quite intense and accentuated by any movement of the head. There were no other abnormal physical findings.

On the twelfth day there was a marked improvement, the temperature dropped to normal and stayed there. The patient made a rapid and uneventful convalescence. The treatment throughout was symptomatic.

The following laboratory work was done. Blood Kahn negative; blood cultures showed no growth; blood serum showed no agglutination with paratyphoid A and B. Through the kindness of the Army Medical Department Research Board at the Bureau of Science, Manila, P.I., a Weil-Felix reaction was done with the patient's serum taken on the eighth day of the disease. The result was a positive agglutination of 1 to 320 with proteus X-19.

This case is believed to be a sporadic case of mild endermic typhus or Brill's disease. The diagnosis is made on the eleventh day, temperature with severe headaches, rash, and positive Weil-Felix reaction. It is reported because typhus is uncommon in the Philippines and especially in the case of families of naval personnel.

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#### REPORT OF A CASE OF SKIN SENSITIVITY DUE TO HEAVY METALS

By J. R. LYNAS, Lieutenant, Medical Corps, United States Navy

Skin reactions to arsenicals are not so rare at the present time. One occurs in about every one to two thousand arsenical injections (1). The number of mild and severe reactions is about equal in a large series of treatments. Reactions usually occur following the fourth to the fifth treatment and the danger of a reaction becomes



less as the number of injections increase, and also in the later course of treatment. In the younger patients, 18 to 30 years of age, there is a greater tendency for mild cutaneous disturbances to appear, while in the older patient the chances are that if he has a reaction it will be a severe one. It has also been observed that mild reactions take place more than twice as frequently in females than in males, and that in primary syphilis severe reactions show their highest rate (2).

Skin reactions to mercury, even though they occur, are much more uncommon. They are not so apt to be severe, and they usually take place during a course of rubs, and may be due to too vigorous rubbing. Sometimes a reaction is precipitated in an individual with a sensitive skin by giving an arsenical in combination with mercury rubs or injections. Also the insoluble salts appear to be more offensive in their respect (1).

Reactions of the skin to bismuth are comparatively rare, and are usually mild, though a severe dermatitis exfoliativa may occur.

It is not difficult to conceive how an individual who happens to be sensitive to the arsenicals, mercury, and bismuth might be sensitive to the other heavy metals. It is such a case that will now be reported.

This man was last exposed in Norfolk, Va., about April 4, 1930. The chancre appeared about the 1st of May 1930. The margins were indurated. On the above date his blood Kahn was 4 plus. A diagnosis of syphilis was made on May 7, 1930. His second injection of neoarsphenamine was on May 14, the third on May 21, the fourth on May 28, and the fifth on June 4. Following this injection he noticed itching of his face, legs, and feet. His sixth and last treatment was given on June 11, after which he became rapidly worse, developing, according to the description, a typical dermatitis exfoliativa. On the 15th he was treated with blue ointment for pediculosis pubis, which aggravated his condition. He was then transferred to the Naval Hospital, Norfolk, Va., diagnosis undetermined, dermatitis exfoliativa. This was changed to dermatitis venenata 2 days later.

Treatment was supportive, with daily 5 percent sodium bicarbonate baths followed by olive oil.

The blood picture showed a leucocytosis going as high as 28,000, and an eosinophilia as high as 73 percent. Kahn was negative on August 13, 1930.

After 113 days on the sick list he was discharged to duty.

On April 30, 1931, almost a year after contracting syphilis and over 10 months after his last arsenical injection, he was given an intramuscular injection of 1 grain of mercury salicylate.

The dermatitis resulting was almost an exact repetition of the previous attack. Diagnosis was changed to dermatitis venenata, cause undetermined, and after 70 days on the sick list he was discharged to duty.

Nineteen days later, July 29, 1931, another attempt was made to institute treatment with an intramuscular injection of 0.5 cc of bismosol, given at 9 a.m. By 4 p.m. generalized itching, macular rash appeared, which developed into the same type of dermatitis as in the previous attacks. Diagnosis of poi-

soning acute antisyphilitic bismosol was made. During his treatment mercurochrome was used as a cleansing agent prior to giving sodium thiosulphate intravenously, and caused many severe cracked weeping lesions on both arms. The intravenous medication was then discontinued.

After 51 days more on the sick list this man was again sent to duty. He was not to remain there long, however. His first day of duty was spent chipping paint from 0800 to 1630. Within 24 hours an itching rash appeared on the dorsum of his hands and fingers, posterior aspect of thighs, on buttocks, and abdomen. He did not report his condition to his medical officer. Two days later he was given a job of painting with red lead, and the rash became full blown in a few hours, which necessitated his transfer again to this hospital for treatment, the diagnosis being dermatitis unclassified, cause undetermined. The dermatitis was in all respects similar to that present on previous occasions, except that it was not quite as severe. Under daily potassium permanganate baths and intravenous sodium thiosulphate he cleared rapidly, and was returned to duty after 37 days on the sick list. Unfortunately there is no record of a blood count.

Six months later this man took a prophylaxis in the form of a sanitube which resulted in a rash appearing over his body with marked edema of his penis, and a slight urethral discharge. The rash cleared without any particular treatment. At this time the patient did not inform his pharmacist mate of the rash or the urethral discharge. However, it did not take many days for his gonorrheal infection to force him to turn in with an epididymitis. He had been in the hospital approximately 1 month on this occasion when he discovered he had "crabs." He showed them to the pharmacist mate, who very kindly gave him some blue ointment. In a few hours his penis and scrotum became swollen, itched intensely and he began to feel badly. The patient did not tell anyone of his condition, and on the morning of the second day the medical officer noticed his edematous eyelids, and that the man appeared quite sick. Questioning brought out the above information, and physical examination revealed a weeping dermatitis of the penis, scrotum, and crotch. The skin of the entire body and extremities was brawny and a dark red color. The upper eyelids and face were edematous and inflamed.

He recovered quite rapidly under intravenous sodium thiosulphate and colloidal baths followed by olive oil. In about 3 weeks desquamation was complete except for the palms of his hands. The gonorrheal infection became arrested about this time, and the man was brought before a board of medical survey and his discharge from the service was recommended.

#### COMMENT

This case is remarkable for the number, seven in all, of the cutaneous reactions there were to the heavy metals. He showed a sensitivity to arsenic in the form of neoarsphenamine, intravenously; to mercury in the form of mercury salicylate intramuscularly; blue ointment, calomel ointment, and mercurochrome applied locally; bismuth in the form of bismosol intramuscularly; and to lead in the form of red lead. The belief that one reaction was due to red lead was not supported by any laboratory work. On the other hand, there was nothing in his history, treatment, or physical examination to indicate any other causative factor. All of these reactions were

severe or moderately severe except those due to mercurochrome and calomel ointment.

Leucopenia and eosinophilia usually accompany a dermatitis exfoliativa, and so it is interesting to note that during the first attack, which was due to neoarsphenamine, there was a leucocytosis of 28,000. The differential count showed an eosinophilia of 73 percent. This gradually returned to normal as he recovered. During the last reaction, causative agent blue ointment, there was no increase in leucocytes or eosinophiles.

The total number of sick days was 309 during the 2 years following the institution of antisyphilitic treatment.

It is significant that this man had so many severe skin reactions without losing his life.

#### BIBLIOGRAPHY

- (1) Stokes: Modern Clinical Syphilology.
- (2) Cole, H. N., M.D.; Moore, J. E., M.D.; O'Leary, P. A., M.D.; Stokes, J. H., M.D.; Mile, U. J., M.D.; Clark, T., M.D.; Parran, T., Jr., M.D.; and Usilton Lida, J., M.A.; Venereal Disease Information, vol. XIV, August 1933.

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#### AN ATYPICAL BLOOD DYSCRASIA

By JAMES F. HAYS, Lieutenant, Medical Corps, United States Navy

The following case is presented because of its relative rarity in an individual of his age and also of its peculiar mode of onset. The diagnosis was very confusing until the latter and terminal stage of the disease, when a typical picture unfolded itself. Although the blood picture was suggestive and led to several clues, the exact diagnosis was not made until near the end of the disease. From the previous medical history there was no indication of any condition simulating the terminal disease.

R. C. B. entered hospital December 3, 1932, with the following complaints:

1. Pain in the region of the gall bladder.
2. Nausea and vomiting at times.
3. Weakness.
4. Loss of weight.
5. Jaundice.
6. Gas on the stomach.

*Family history.*—Essentially negative.

*Past history.*—Usual childhood diseases without complications. Measles, age 30; influenza, 1930; gonorrhea, 1919; denies lues. No operation other than tonsillectomy 1927. No serious injuries. Stomach trouble since 1918. During the war he was on the sick list 100 days with stomach trouble and was surveyed on account of chronic gastritis.

*Social history.*—Married 14 years, wife living and well and she has had no miscarriages. Seven children, all living and well. Occupation, farmer.

Habits, uses alcohol and tobacco very little. No vicious habits. Leads a well-regulated life.

*Systemic review.*—Frequent headaches, usually in the morning soon after getting up, but they soon pass off. Nose discharges continually, never had any sinus involvement. Subject to head colds. States eyesight is bad and has had to use glasses for past 15 years. Frequent sore throats until tonsils were removed in 1928.

*Cardiorespiratory system.*—Essentially negative.

*Gastrointestinal.*—Appetite fair only. At the time he has colicky pains in his abdomen and for a week after he eats little or nothing. Gnawing pains in abdomen, have no relation to food. Gaseous eructations and distension. Always constipated. Jaundiced twice associated with putty-colored stools. At one time he had very dark stools, looked black to him. Severe cramping pain in the abdomen associated with nausea and vomiting, vomitus consists of a yellowish-green liquid which is very bitter. For further G.I. review note present illness.

*Nervous and mental.*—Sleeps poorly. At times he becomes quite nervous and upset for no reason at all. Worries considerably about his condition. Weight, average 140, highest 152, now 137½.

*Present illness.*—Dates back to 1918 with rheumatism and cramplike pains in abdomen. Hospitalized for 100 days and at the time of discharge he was greatly improved but still had some slight abdominal soreness. Until his second admission to this hospital in 1929 he had frequent recurrences of these attacks, but they were not severe enough to cause him any great inconvenience. It was not until January 1929 that he began to have attacks which were of a serious nature. At this time he had sudden cramplike abdominal pain radiating to both shoulders and to the back of his neck associated with nausea, vomiting, cold sweats, and great weakness. Hospitalized for about 10 days for examination, and a diagnosis was made of duodenal ulcer. After discharge he got along very well for about 10 months—then he had another mild attack which caused him but little discomfort. Later he had two severe attacks, and after the second one was admitted to the Diagnostic Center, Washington, D.C., and a diagnosis of cholelithiasis was made. He has been admitted to this hospital twice since with the diagnosis chronic cholecystitis, and each time, after gall bladder drainages were done, he apparently got very much better immediately, rapidly gaining weight and strength, and becoming symptom free. Admitted the last time December 3, 1932.

Patient discharged this hospital December 12, 1931. For 6 months after discharge he got along very well, but in July he had an attack of epigastric pain, associated with nausea, vomiting, jaundice, cold sweats, and extreme weakness. He was forced to stay in bed for 3 months. He improved very slowly and could not regain his strength as quickly as he formerly had done. He attributes this to the fact that his gall bladder was not drained. He had little or no appetite, and foods did not agree with him. At times the eating of food, he thought, would cause an acute paroxysm of pain with the associated symptoms just given. At other times these attacks would come on when his stomach was empty. Occasionally he had gnawing pains in his abdomen when he would miss a meal or the meal delayed. He was admitted as a patient in a Kentucky hospital and remained there 2 months but got no better, so he went home. About 2 weeks prior to his last admission he had his worst attack, lasting 3 days, and it required four hypodermics before he was relieved from his pain. Finally he was admitted to this hospital again for treatment.

*Physical examination.*—Essential points are: Well-developed and fairly well nourished white male, age 42, giving a good account of himself. He is some-

what jaundiced, but not to a marked degree; apparently ill, but not suffering a great deal at this time. Eyes: Sclera has slight ictroid tinge; otherwise negative. Tongue heavily coated; protruded in mid-line. Breath bad. Teeth: Many out; others in good dental repair. Tonsils absent. Chest, lungs, and heart essentially negative. Abdomen: Well formed; moves evenly with respiration. Abdomen soft and no evidence of rigidity except for an area about the size of the palm of one's hand in the epigastric and right hypochondriac regions. Tenderness elicited only on deep palpation. There was definite guarding of this area when deep pressure was attempted. No masses palpable. Left-inguinal ring slightly relaxed. Inguinal glands slightly enlarged. Reflexes present and active. Otherwise physical examination was negative. For the first 5 days patient's condition remained the same practically, his only complaint being epigastric discomfort. On the seventh day he ran a fever of 103° F., pulse 100. At that time there was a great deal of catarrhal fever in the ward, and it was believed he had developed that disease. Usual treatment carried out with good results; however, during this time he was never free from vague pains in the epigastric and right hypochondriac regions. He developed a peculiar lemon yellow, pasty color during these few days. The blood picture at this time showed a moderate anemia with 60 percent hemoglobin and a color index of 0.9. There was a predominance of lymphocytes. A week following the initial rise in temperature he ran a fever of 103° F., with a corresponding pulse. He complained of a "stitch" in his left side, and examination revealed he had developed a fibrinous pleurisy with a definite friction rub in the left mid-axillary line; the friction fremitus could be easily located by palpation. The left chest was strapped and codeine was given for cough and pain. A white-cell count showed 3,300 white cells with 75 percent lymphocytes, a leukopenia with a relative lymphocytosis. A day later it was believed the patient would develop pneumonia, but this did not happen. Two days later he had a definite pleurisy with slight effusion which was confirmed by X-ray. All during this time he complained of vague pains referable to the right hypochondrium. There was definite guarding of the muscles in this region to palpation although there was no rigidity elsewhere of the abdominal muscles; the abdomen being soft and no other areas of tenderness.

A blood count on December 21 showed a progressive anemia and leukopenia, the red cells falling to 1,940,000, white cells to 1,300, and hemoglobin to 53 percent with a continued relative lymphocytosis. On December 23 a blood transfusion of 500 cc of whole blood was done by the direct method. A severe reaction followed the transfusion; fever, 105° F.; pulse, 120; blood pressure 86/50. The pulse was weak and thready. The usual care was exercised, but the patient for the next 6 days ran a very high fever, as the chart indicates. A blood count taken 2 days later showed an increase in the red cell count, but a progressive lowering of the white cells. It was believed the spleen to be palpable at this time and the liver was enlarged one finger below the costal margin. A blood culture at this time was negative. Agglutination for Malta fever was negative. Blood Kahn was negative. Stools were negative for ova and parasites. Icterus index 11.4; Van Den Berg reaction was direct delayed. Typing showed type "O." Urine negative. The patient was becoming noticeably weaker, and the lemon yellow tint to the skin deepened. On account of gastric distress with pain the liver extract, iron and ammonium citrate, was discontinued temporarily. He had a slight nose bleed December 28, the first noted.

On December 30 the second transfusion was done. Five hundred cc of whole blood by the direct method was given. While in the operating room a button of bone was removed from the sternum for diagnostic purposes. The report

showed the specimen completely decalcified. On microscopic examination there was a marked decrease in the number of neutrophils, erythroblasts, erythrocytes, and megakariocytes. The reticulo-endothelium appears hypoplastic. These cells had been replaced by a fine fibrous reticulum of fat tissue. Following the second transfusion he had a marked reaction; fever 106.4° F. by axilla, accompanied by a chill. He was very weak with beginning delirium. On January 2 liver extract and iron and ammonium citrate was again started in conjunction with neucleotide, one ampule daily intramuscularly in hopes of stimulating the white cell production. During the interval between December 30 and January 4, 1933, the patient was mentally fogged and very restless. Because he refused nourishment, glucose was given by Murphy drip.

On January 6 the mental condition of the patient had cleared up, leaving him wondering what had happened in the interim. Since the last transfusion on December 30 and during the time the patient was mentally confused, he was running a high fever during the day, 103° to 105° F., and dropping to 99° F., or normal, in the morning. Patient transfused again, 300 cc of blood this time. Following this transfusion he got along very well, with little or no reaction. The red cells, hemoglobin and platelet count, were gradually on the upward trend, while the fever was gradually coming down. Three blood transfusions of 300 cc each were given within the next week with no untoward reaction except the patient complaining of great weakness. The pain, discomfort, and localized rigidity was ever present in the region overlying the gall bladder.

On January 24 the blood picture looked encouraging with the red cells 3,500,000, hemoglobin 79 percent, and a rise in the white cells to 17,950 with a differential count giving the segmented cells a predominance over the lymphocytes. The platelet count was beginning to fall again, the peak being reached January 12 with 148,800.

Patient's condition was considered to be slightly improved between January 15 and 29. He complained only of slight discomfort in the region of the gall bladder and at times of constipation. Patient passed black tarry stools which were very foul smelling; no red-blood cells were noted, but the benzidine test was strongly positive for occult blood. There was no evidence of petechial hemorrhages at this time.

On January 29 patient ran a very high fever, was very restless, and complained of sudden excruciating pain extending from the lumbo-sacral region down the back of his thighs. The point of maximum intensity was in the left gluteus maximus muscle. It was so localized that he could put the tip of his finger on the area, pressure here causing him to writhe with pain. The pain was very acute and lancinating, and one-half grain of morphine was given for relief. The following morning about an hour after he was first visited he suddenly developed severe cramplike pains in his abdomen associated with vomiting and prostration. There was boardlike rigidity of the abdominal muscles. No operative procedure decided upon. During the late afternoon the pain and rigidity had subsided to a considerable degree. Morphine given for the back pain. An emergency blood picture at this time showed no marked change. The following day he was free from his abdominal and back pain but was noticeably weaker. For the following 9 days he got along fairly well but complained of extreme weakness. It was during this interval that the spleen could be definitely palpated. All superficial lymph glands were enlarging.

On February 9 he again experienced a similar attack to those just mentioned, the back and leg pain ushering in the acute abdominal pain. These pains were excruciating and almost unbearable. Temperature 104.2° F.; pulse 105. These attacks were always accompanied by a high fever and prostration.

Emergency blood count was 2,520,000 red cells; 20,550 white cells, with a predominance of lymphoblasts. Platelet count had fallen to 7,560. The aftermath of this attack was accompanied by emotional instability, and he fretted and cried a great deal. At this time petechial hemorrhages were noted about the anterior axillary folds, over the chest and abdomen. A little blood was noted oozing about the gums of the upper central incisors. Glandular enlargement progressing noticeably. Gall bladder drainage was ordered, the first being a failure. The second, however, was successful, and very dark murky bile drained which contained some debris, no cells or crystals but with considerable bacteria. On account of the progressing weakness of the patient, gall bladder drainages had to be discontinued. A progressive increase in the size of all superficial lymph glands was noted.

On February 20 he had his final attack of back, leg, and abdominal pain. Attention is invited to the interesting sequence all these attacks followed—excruciating lumbo-sacral pain radiating down the back of the thighs to the ankles accompanied by a definite point of tenderness in the left gluteus maximus muscle, followed later by cramplike pains in his abdomen with extreme tenderness and a high fever.

Three days prior to his death he began to cough and vomit a little blood, which increased to a considerable amount the day he died. More petechial hemorrhages were noted over the body. During this interval he was so weak he could hardly move in bed and it was difficult for him to talk. All treatment was discontinued and morphine given freely for rest and hemorrhage. Blood count showed an enormous increase in the white cells, 82,500, with 5 percent granulocytes and 95 percent lymphocytes; the platelet count dropped to 4,320; hemoglobin, 45 percent. The adenopathy had increased until most all superficial lymph glands could be seen as well as palpated.

On February 25 he died of cardiac failure and pulmonary edema.

#### AUTOPSY REPORT

Body is that of a white male, poorly developed and emaciated, about 40 years of age, 71 inches in height, and weighing about 110 pounds. The oral mucous membranes are very pale, and there is evidence of recent hemorrhage from the mouth. There is a generalized distribution of petechiae and purpuric spots over the torso and extremities. Most of these appear fairly old. There is a 2-inch scar of a recently healed incision over the sternum.

In the small intestines areas of discoloration are seen through the peritoneum. Upon opening the intestinal tract these appear to be areas of submucosal hemorrhage. The liver is enlarged three fingers breadth below the costal margin. The gall bladder is grossly distended with a thin opaque, whitish fluid. The length of the gall bladder is 14 centimeters. The wall is quite thin, but the contents are not under any great tension. The hepatic and common ducts are patent. The cystic duct has a constructive fibrous band in its wall, about 2 centimeters from the common duct, which inhibits the passage of a probe. The spleen is about four times its normal size, presenting itself conspicuously in the abdomen. The mesenteric lymph nodes are prominent and suggests some enlargement.

There is a normal amount of pericardial fluid. The heart is of the small drop type. There are multiple purpuric spots in the anterior epicardium. The musculature is rather soft. The lungs are freely movable and there is marked hypostatic congestion in both bases. The musculature of the heart has an anemic appearance. There are multiple purpuric spots in the anterior epicardium. The aorta reveals several atheromatous plaques.

The liver is larger than normal, and its borders are sharply defined. The capsule is smooth and glistening. The consistency of the liver is firmer than normal and cuts with increased resistance. The cut surface oozes freely. The parenchyma is pale brown. The central veins are readily distinguished.

The spleen is about four times its normal size and very firm in consistency. The general shape is preserved as are the notches. The capsule is thin, of leaden-gray hue, and opaque. The spleen cuts with marked increased resistance. Scraping the cut surface does not remove any pulp.

#### MICROSCOPIC PATHOLOGICAL REPORT

**Lungs:** The septal capillaries are markedly enlarged with lymphocytes which spill over into the alveolar spaces. The alveoli are distended by red blood cells, hemolized blood and edema. Occasionally alveoli are seen containing a number of large mononuclear cells. The periarterial and peribronchial tissues are infiltrated with lymphocytes. The vessels are enlarged.

**Heart:** There is mild granular degeneration of the muscle fibers. There is some lipochrome pigmentation about the nuclei. The striations are very poorly defined. There is a slight infiltration of lymphocytes between the muscle fibers. The intermuscular capillaries are engorged with lymphocytes.

**Liver:** The polygonal cells show considerable granular degeneration. The portal spaces and vessels are crowded with lymphocytes. This is in contrast to the sinusoids and central veins which contain comparatively few lymphocytes. The sinusoids and central veins are moderately congested with red blood cells.

**Gall bladder:** The mucosa is thinned out, quite smooth, presenting very few mucosal folds. The submucosa is decreased. The muscular coats appear atrophied. There are no inflammatory cells present.

**Spleen:** There is some thinning of the capsular and trabecular connective tissue. The malpighian corpuscles are obliterated by a diffuse over growth of lymphocytes which lie loosely in the discorded cords and sinuses. The lymphocytes are fairly uniform in size. The spleen as a whole is congested with red blood cells.

**Kidneys:** There is considerable disintegration of the glomerular tufts, which are congested with lymphocytes. The tubular epithelium shows fairly marked granular degeneration. The lumina contain granular amorphous material. The interstitial tissue is markedly infiltrated with lymphocytes. Vessels are enlarged.

**Adrenals:** The cortical parenchyma shows a mild degree of granular degeneration. The capillaries of the medulla are congested with lymphocytes.

**Lymph nodes:** The entire lymph node has been converted into a diffuse mass of lymphoid tissue. Lymph follicles cannot be delimited. The lymphocytes are fairly uniform in size.

**Small intestines:** The mucosa and submucosa are markedly infiltrated with lymphocytes. The muscle coat is rather thin.

**Bone marrow:** The normal architecture of the bone marrow, such as fat cells, sinuses, etc., are obliterated by multiple foci of hyperplastic round cells. In some areas these foci have coalesced presenting a more diffuse picture of pure lymphoid growth.

#### DISCUSSION

The diagnosis in this case was very confusing because the characteristic clinical findings and blood picture were lacking. There was little if any enlargement of the superficial lymph glands until the



termination of the disease. Although there was a qualitative change in the blood picture as shown by the predominance of the lymphocytes, at the time there was a marked leukopenia, the total leukocyte count did not rise until the 50th day of the disease and then failed to make progress until shortly before death when there was an unmistakable deluge of lymphocytes into the blood stream. This fact along with the transfusions and the late superficial adenopathy made the diagnosis a matter of great difficulty.

Acute lymphatic leukemia may start very suddenly so that for some time the exact diagnosis is missed. The disease is more common than is usually thought. In this case the age of the patient was a little misleading because acute lymphatic leukemia seldom is found in a patient over 30 years of age. An acute leukemia not infrequently superimposes on the chronic form and when this happens it terminates rapidly in the death of the patient.

The palpable spleen, purpuric manifestations, superficial lymphatic gland enlargement, fever, asthenia, bone pains, hemorrhages from the gums and into the bowel were all typical findings of acute lymphatic leukemia, although most of these did not manifest themselves until late in the disease. The acute form runs a very rapid and fatal course as this case did. The lymphatic glands and spleen are usually somewhat enlarged but in some acute cases there is no enlargement noted due to the suddenness of onset and rapid termination of the disease.

In the blood findings there is not such a marked leukocytosis as compared with chronic lymphatic leukemia, the usual count varying between 50,000 and 100,000, the higher the count the more suspicion is thrown on the chronic form. There is a great variation in the total white cell count in this form of leukemia. There is a tendency to lower or even normal counts and sudden variations from day to day may occur. It is not rare to find aleukemic periods with normal or low counts in the course of acute lymphatic leukemia. The differential count shows the lymphoblasts to outnumber the lymphocytes and the total of these two types of cells may form as high as 99 percent of all white cells.

There is usually a marked anemia. At first it is not marked but rapidly increases in severity until it is not uncommon to find the red cell count below 2,000,000 with a hemoglobin content of 40 percent. The color index is low at first but tends to get higher and there is marked changes in the size and shape of the red blood cells. Nucleated cells and megaloblasts make their appearance. Often there is a very rapid fall in the red cells and hemoglobin and several million red cells are lost in the course of a few days, hemorrhage and diseased bone marrow being responsible for this. Anemia in

many cases apparently is the cause of the rapid and fatal outcome. The platelets are always diminished and it is remarkable how low they get sometimes before purpuric manifestations appear.

The bone pains which in this case were very striking were probably due to the encroachment of the cells on the bone marrow and to marrow hyperplasia.

In chronic cholecystitis there is little or no increase in the white-cell count. In an acute exacerbation of a chronic cholecystitis there would be in a moderately severe attack a leukocytosis of from 12,000 to 25,000, the percentage of polymorphonuclear neutrophils being above 80 percent. In a very severe acute attack the white-cell count would probably exceed 60,000 with the neutrophile percentage above 80 percent. In some instances an overwhelming attack will not produce a leukocytosis.

Some investigators believe that leukemia is caused by an infection, although this has never been proven.

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#### REPORT OF A CASE OF CHORIOEPITHELIOMA IN A MALE

By J. W. ELLIS, Lieutenant Commander, Medical Corps, United States Navy

CASE M. T. H. Admitted, June 2, 1932, ambulatory; admitting diagnosis, stone left ureter.

*Chief complaint.*—Attacks of sharp pain in the left lower abdominal quadrant, occasionally radiating to the left testicle.

*History of present illness.*—Patient was well until 3 months prior to admission when he began to have spasmodic attacks of sharp pain starting in the lower left abdominal quadrant and radiating to the left testicle. These attacks were not severe until 2 weeks prior to admission, since when he has been receiving morphia twice daily for relief. For the past 2 days the pain has been continuous. He has lost 30 pounds in weight in the past 3 months. His appetite is very poor; 1 hour after meals the pain is intensified; bowels have been regular. He has experienced difficulty in urinating and has had a swelling in the right testicle. He complains of nervousness and insomnia. No pulmonary or cardiac symptoms.

*Past medical history.*—Measles, mumps, whooping cough in childhood; scarlet fever in his twelfth year; pneumonia in 1923. No history of operations.

*Family history.*—Father died of influenza; mother living and well. No history of familial disease.

Age 33; truck driver; married. Wife living and well. Four children living and well. No miscarriages. No venereal history. Drinks occasionally. Does not smoke. Has used morphine for past 2 weeks.

*Physical examination.*—Temperature 98°. The patient is a well-developed white adult male, moderately well-nourished. He appears ill. There is an icteric tinge to the sclera and skin. Hair excessive and normal distribution.

Eyes: Pupils equal and react equally to light and accommodation.

Ears: No abnormalities noted.

Nose, throat, and sinuses: Slight deviation of septum; atrophic tonsils; sinuses are negative.



**CASE OF CHORIOEPITHELIOMA IN LEFT KIDNEY FOSSA.**

**X-ray shows the right kidney normal; left kidney rotated, pelvis and calyces distorted. Upper portion of left ureter is displaced laterally and has a filling defect.**



Chest: Expansion full and equal percussion and palpation negative.

Lungs: No abnormalities.

Heart: Normal in outline; sounds regular and of good muscular tone. Rate, 70. Blood pressure, 115/70.

Abdomen: There is a fullness in the left abdomen. This mass extends from the ensiform to 5 centimeters below the umbilicus and laterally to the mid-axillary line. The mass is smooth and tender. The axillary, inguinal, and posterior cervical glands are enlarged.

Genitalia: The right epididymus is very hard, tender, and slightly enlarged. No hydrocele, varicocele, or changes in testicle noted.

Anus: There are small external hemorrhoids.

Skin: Across the back, chest, shoulders, and neck there is an acnelike eruption.

Nervous system: Reflexes normal.

Cystoscopic examination and pyelograms showed the right kidney to be normal; the left kidney is rotated; the pelvis and calyces are distorted and the pelvis is flattened. The upper portion of the left ureter is displaced laterally and exhibits a filling defect. The pain felt when the kidney pelvis was distended with the opaque solution was not like the pain of which he usually complains.

*Laboratory reports.*—Blood: Red blood count, 4,100,000; white blood count, 7,950; hemoglobin, 80; polys., 67; lymph., 34.

Urine: Negative. Kahn: Negative.

Coagulation time: 1 minute and 35 seconds.

June 18, 1932.—Chest X-ray: The chest is clear, diaphragms move and are in normal position. The heart is normal and the posterior mediastinum is clear. Barium enema: The colon is negative; the transverse is free and movable; the cecum is negative. The preoperative diagnosis was a tumor in left renal fossa.

June 22, 1932: Given a transfusion of 500 cubic centimeters blood (Scannell method.) Under spinal anesthesia the left kidney region was exposed. There was a tumor mass the size of a fetal head which had dislocated the kidney upward. The tumor had a broad attachment to the sheath of the psoas muscle and to the spine and was very vascular. It was removed with difficulty.

*Pathological report.*—Endothelioma (diffuse type of Ewing).

June 24, 1932: Reacting well. Red blood count, 2,850,000; hemoglobin, 54.

June 25, 1932: Transfusion, 250 cubic centimeters (Scannell method).

July 8, 1932: Red blood count, 3,162,000; hemoglobin, 64.

July 16, 1932: Patient's convalescence had been satisfactory. Wound was well healed. Today started to complain of pain in abdomen similar to that he had before operation.

July 17, 1932: Cystoscopic examination, left kidney did not drain. Chest X-ray, shows metastatic growth in lungs about 1 centimeter in diameter, Deep X-ray therapy started.

August 13, 1932: Tumor in abdomen has recurred.

September 3, 1932: Both breasts show a uniform diffuse enlargement beneath the nipples. There is intense bronzing of the skin over the entire body. The disease continued to progress and the patient died September 26, 1932.

*Autopsy report.*—The body is that of a normally developed white male markedly emaciated, of about 33 years; height, 68 inches; weight, 120 pounds. Post-mortem lividity is present over dorsum of body; rigor mortis is well developed. Peculiar diffuse bronzing of skin is noted.

Beneath each nipple there is noted a soft tumor mass fairly well circumscribed and about the size of a half-dollar. Masses are apparently in the subcutaneous tissue and adherent to the overlying skin.

Chest: Opened with midline incision, sternum reflected. Note: the tumor masses located beneath the nipples are found to be grossly of a fibrous, fatty consistency suggesting fibrolipomata. They are well embedded in the subcutaneous tissue and closely adherent to the overlying skin.

Lungs and pleurae: The pleural cavities contain no excess fluid but there are dense interpleural adhesions present at both bases and over middle and upper lobes right side and upper lobe left. The lung surfaces are studded with metastatic nodules of a dark red-yellowish mottling and ranging in size from that of a pea to that of a small hulled walnut. Gross section reveals these nodules through the substance of both lungs. The little normal lung tissue remaining shows marked passive congestion and from the smaller bronchi, a thin yellowish exudate can be expressed. The pulmonary vessels contain post-mortem clot.

Pericardium and heart: The pericardium is densely adherent to the surrounding pleura. Opened it is found free from adhesions and plastic exudate; contains about 20 cubic centimeters of a clear straw-colored fluid. The heart appears normal as to size and position. The musculature is relaxed and flabby and rather pale or anemic. The valve leaflets are free from vegetations, calcified plaques, and atheromatous changes. The tricuspid ring is moderately relaxed (easily admits three fingers). The aorta shows no gross changes, the coronaries are patent and filled with blood. Weight of heart, 180 grams.

Abdomen: Opened through midline incision. Stomach and intestines are collapsed and show no gross lesions.

Liver: The capsule is smooth and glistening; there are no adhesions; the organ appears considerably enlarged and is of a uniform, very dark red color which on gross section is found due to a marked passive congestion. There are no gross lesions, metastases, etc., demonstrable. Estimated weight of liver, 2,000 grams.

Gall bladder and common duct: Gall bladder is free from adhesions and contains a small quantity of dark bile; empties easily under pressure. No evidence of stones. Common duct is patent and contains no stones.

Pancreas: There is evidence of considerable atrophy especially throughout head and proximal portion of body. Organ cuts with considerable resistance suggesting advanced fibrosis.

Kidney and adrenals: The right kidney is considerably enlarged and passively congested (weight, 215 grams). Contour presents markings of fetal lobulation. The capsule strips with ease. Cut surface appears deep red and congested. About cortex are noted several small wedge-shaped areas of soft yellowish consistency suggestive of infarcts and necrosis. The pelvis and calyces show thickening and there is a thin yellowish exudate present over their surfaces. The ureter is apparently normal except at pelvis of kidney where there is evident thickening and accumulation of exudate. The right adrenal appears normal in size and anatomical position but is of a dark yellowish brown color and very friable.

Left kidney: The left kidney is found displaced upward and somewhat laterally from its normal position. It is only about two-thirds normal size with a greatly thickened capsule which is densely adherent to the overlying peritoneum and lumbar fascia beneath. Enucleated, the kidney is easily shelled from its capsule and presents a pale yellowish and red mottled appearance. The contour is greatly distorted and there are surface markings suggest-

ing fetal lobulation. The cut surface presents the same yellowish red appearance, is soft, and of a crumbly, necrotic texture. The cortical and medullary markings are only faintly visible. The calyces and pelvis are greatly thickened and their cavities reduced in size. The ureter is also greatly thickened and distally toward the bladder its lumen is practically obliterated. The left adrenal cannot be identified.

**Spleen:** The spleen is contracted and very friable. The pulp is of a soft, semifluid consistency with evident loss of reticular tissue. Weight, 80 grams.

**Tumor masses retroperitoneal:** Situated in the retroperitoneal space just to the left of the midline of the fourth lumbar vertebra is found a soft, ovoid, lobulated tumor mass almost the size of a kidney. The tumor is enclosed in a thick fibrous capsule composed of the overlying peritoneum and the psoas fascia beneath. Over its anterior surface pass the common iliac vessels and left ureter. The enucleated tumor mass presents a dark red and yellow mottling with central necrosis and liquefaction. About the level of the twelfth thoracic vertebra and slightly to the left of its midline, there is a second tumor mass similar to the above described but somewhat smaller. Enucleation and section reveal hemorrhage and necrosis throughout practically the entire structure. This mass is encapsulated as the one above described and over its anterior surface courses the right ureter. The retroperitoneal lymph glands are enlarged and intimately attached to these tumor masses. The mediastinal glands are likewise enlarged but there are no demonstrable tumors in this structure.

**Anatomical diagnosis:** The gross appearance of the tumor masses found in both kidney regions, similar metastatic processes so prevalent in both lungs, the appearance of the right adrenal and changes noted in left kidney, the history of a large tumor mass having been removed from left kidney fossa at operation some few months ago, and the peculiar bronzing of the skin, together with marked emaciation of the body, point toward metastatic carcinomatosis of adrenal origin; the changes noted in pancreas and spleen also being considered.

**Further pathological findings:** Passive congestion of liver, atrophy and fibrosis of pancreas, atrophy and necrosis of spleen, compensatory hypertrophy and passive congestion of right kidney with focal areas of infarction and necrosis, possible malignancy of adrenal origin involving left kidney with degenerative changes and necrosis.

**Pathological report—Pathological examination of tissue (autopsy).**—Section shows large sheets or bands of characteristic acidophile syncytium, among which are seen groups of large cells with hyperchromatic nuclei maintaining a kind of villous arrangement typical of Langhans' cells. Mitotic figures are numerous among these cell groups. Surrounding the better preserved areas of syncytium and Langhans' cells are extensive areas of fibrous tissue and necrosis with large lymphocytic deposits.

**Diagnosis.**—This tumor is considered a chorioneplithelioma which apparently had its origin in embryonic remnants of the Wolffian bodies.

**Left kidney:** Examination discloses extensive hyaline degenerative changes involving tubular epithelium and glomeruli. There is considerable proliferation of intertubular connective tissue.

Chronic diffuse nephritis with hyaline degeneration and fibrosis.

**Pancreas:** Examination reveals fairly normal parenchyma, but moderate increase of perilobular connective tissue stroma and thickening of blood vessels.

**Spleen:** No evidence of metastasis. Loss of reticulum, moderate lymphoid hyperplasia.

**Liver:** Essentially normal. No metastasis. Slight increase in perilobular connective tissue. Moderate passive congestion.

**Lung:** Examination of section through a nodule, which in the gross is interpreted as a metastatic process, discloses sheets of large cells with hyperchromatic nuclei. Section is greatly obscured by extravasated r.b.c., serum, and fibrin, but presence of large numbers of cells resembling the Langhans' cells from retroperitoneal tumor indicates a true metastatic process.

**Pancreas:** Section reveals fairly normal parenchyma. The perilobular connective tissue stroma appears somewhat increased. No demonstrable metastasis.

**Right adrenal:** Examination discloses normal parenchyma. There is considerable congestion of capillaries between cortex and medulla. Aorta appears thickened and fibrosed and there is some increase in connective tissue throughout stroma.

**Tumor of breast:** Gynecomastia.



# NAVAL RESERVE

## MEDICAL CORPS

### APPOINTMENTS, SECOND QUARTER, 1934

Name	Rank	Appoint- ed
Torland, Torleif.....	Lieutenant commander, MC-V(S).....	Apr. 3
Rowley, Walter N.....	do.....	Apr. 10
Dougherty, John A.....	do.....	Apr. 12
Hussey, Frederick V.....	do.....	Apr. 17
Joseph, Louis.....	do.....	Apr. 21
Whitlow, Leslie W.....	do.....	May 1
Butler, Oliver W.....	do.....	May 8
Larsen, Nils P.....	do.....	May 9
Root, Howard F.....	do.....	May 17
Bean, Harold C.....	do.....	May 19
Biern, Oscar B.....	do.....	May 22
Johnson, Charles Isaac.....	do.....	May 22
Hollingsworth, Loren D.....	do.....	May 25
Calcote, Royal J.....	do.....	May 28
Gratz, Charles M.....	do.....	May 29
Phillips, Lyle G.....	do.....	May 29
Proctor, Oscar S.....	do.....	May 29
Gerstley, Manfred J.....	do.....	May 31
McKendree, Charles A.....	do.....	May 31
McCarthy, Lawrence J.....	do.....	June 4
Shaw, Henry N.....	do.....	June 12
Walker, Hastings H.....	Lieutenant, MC-V(S).....	Apr. 1
Gasteiger, Ernest S.....	do.....	Apr. 5
Jenkins, Pierre G.....	do.....	Apr. 5
Balle, Alfred L.....	do.....	Apr. 9
Rudisill, Hillyer, Jr.....	do.....	Apr. 10
King, Harold G.....	do.....	Apr. 12
Sanders, Paul W., Jr.....	do.....	Apr. 12
Goss, Clark C.....	do.....	Apr. 17
Hoedemaker, Edward D.....	do.....	Apr. 18
Scott, Francis A.....	do.....	Apr. 18
Wanamaker, Frank H.....	do.....	Apr. 19
Allison, Stanton, T.....	do.....	Apr. 24
Matthews, William E.....	do.....	Apr. 30
Jensen, Joseph E.....	do.....	May 1
Culpepper, Sebron C.....	do.....	May 2
Roll, Albert T.....	do.....	May 9
Nesche, George E.....	do.....	May 14
Torland, Paul.....	do.....	May 23
Huber, Francis, Jr.....	do.....	June 4
Krock, Frederick H.....	do.....	June 9
Palmer, Alfred M.....	Lieutenant (junior grade) MC-V(G).....	Apr. 5
Fillmore, John R.....	do.....	Apr. 6
Leland, Sherman.....	do.....	Apr. 9
Moleski, Stanley L.....	do.....	Apr. 17
Quinn, Edward M.....	do.....	Apr. 23
Haines, William H.....	do.....	Apr. 27
DeCosta, Edwin J.....	do.....	May 3
Ketchum, Paul D.....	do.....	May 7
Martin, Herman E.....	do.....	May 10
McCarthy, Horace F.....	do.....	May 11
Swenson, Rudolph E.....	do.....	May 19
Lell, William A.....	do.....	June 5

### PROMOTIONS

Name	From—	To—	Ap- pointed
Wilson, Merton C.....	Lieutenant (junior grade), M.C.-F.....	Lieutenant, M.C.-F.....	June 1
Hicks, Wayland K.....	Lieutenant (junior grade), M.C.-V. (G).....	Lieutenant, M.C.-V.(G).....	May 1

## DENTAL CORPS

## APPOINTMENTS LAST QUARTER, 1934

Name	Rank	Ap- pointed
Bevan, George R.....	Lieutenant, D.C.-V.(S).....	Apr. 16
Robinson, Thomas O.....	Lieutenant, D.C.-V.(S).....	May 11
White, Alfred F.....	Lieutenant (junior grade), D.C.-V.(G).....	May 23
Harrison, Israel.....	Lieutenant (junior grade), D.C.-V.(G).....	May 28
Hoey, Edward Chas.....	Lieutenant commander, D.C.-V.(S).....	June 9

## PROMOTIONS

None.





WILLIAM WHELAN.

1808-1865.

The third chief of the Bureau of Medicine and Surgery.

## NOTES AND COMMENTS

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### WILLIAM WHELAN

The Third Chief of the Bureau of Medicine and Surgery, William Whelan, was born September 4, 1808, in Pennsylvania, from which State he was appointed. He was commissioned surgeon's mate March 25, 1828, to take rank from January 3, 1828, no. 4 on the list of assistant surgeons. His service included duty in the West Indian Squadron, Naval Hospital, Pensacola, where he was on duty during the prevalence there of smallpox and yellow fever, and at the naval hospital, Boston, and the Navy Yard, Philadelphia. He was promoted passed assistant surgeon in 1834, standing no. 1 in point of relative merit with those examined the same date. He was commissioned surgeon from February 9, 1837, again being no. 1 on the list. From 1837 to 1840 he was in the Pacific on the U.S.S. *Falmouth*. From 1843 to 1845 he served as fleet surgeon in the Mediterranean Squadron and again from 1849 to 1852. He was appointed Chief of the Bureau of Medicine and Surgery September 23, 1853, by the President, and confirmed by Congress January 23, 1854. He held this office until his death June 11, 1865. He was thus Chief of Bureau during the Civil War and the troubled period that preceded that conflict.

The responsibilities connected with the expansion of the Medical Department of the Navy and the increase of facilities necessary to meet the urgent demands made by the war, were borne by him. His period of office, nearly 12 years, is longer than that of any other Chief of the Bureau of Medicine and Surgery.

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### SYPHILIS NUMBER OF THE BULLETIN

In this number of the Bulletin there has been included a group of articles, comments, and book reviews which, with the annual publication in the preventive medicine section of the valuable and widely sought statistical information regarding the administration of arsenicals in the Navy, constitute a considerable symposium on syphilis.

There is an interesting contribution to the early history of the disease, and one on yaws and syphilis in a small area of the Republic of Panama.

The whole subject of the treatment of syphilis is under fire by modern syphilographers. The two outstanding features of the new ideas in treatment are:

1. Continuous rather than intermittent treatment. (No rest periods.)

2. Standardization of early treatment.

While there are undoubted dangers associated with the development of these new departures in therapeutics medical men treating syphilis are adopting them more and more. In the Navy, despite the fact that in general the treatment of this disease is excellent, there is much criticism of some features and suggestions as to improvements are not few.

In regard to the early treatment of syphilis all medical officers are urged to read with care the article in the Journal of the American Medical Association for April 21, 1934, entitled "Standard Treatment Procedure in Early Syphilis", by Stokes and others. It is reprinted in the April 1934 Venereal Disease Bulletin issued by the United States Public Health Service. This article summarizes the modern principles as to the control of infectiousness of syphilis and outlines a scheme of treatment for the disease in the early stages. This outline describes the alternating continuous arsphenamine-bismuth system of treatment. The principles of reaction prevention given is one of the most valuable features of the article.

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#### BISMUTH IN THE TREATMENT OF SYPHILIS

In a review of the use of bismuth in the treatment of lues, Bethea in the International Medical Digest for May 1934, sums up one of the most important features of bismuth in syphilitic therapy in these words:

One of the greatest advantages in the development of bismuth therapy is that it has enabled the clinician to maintain continuous treatment so ably advocated by Moore, Stokes, Schamberg and Wright and others in contradistinction to the old intermittent plan of therapy. In fact, Stokes and others are now advocating "overlapping treatment"; that is, beginning the use of one specific some days before the previous one is discontinued. The advantage of continuous treatment is one of the phases of modern therapy least understood by the profession as a whole. *As I view this, it is like trying to save a burning house. The firemen do not work awhile and then rest awhile, knowing that the conflagration will spread; they work continuously, using water, chemicals, or whatever may be indicated, until the fire has been extinguished.* We believe today that in the intervals of rest, syphilis may spread, gaining a stronger hold on previously involved structures and invading new areas. It is here that the "mild and gentle" bismuth, with its almost negligible element of toxicity and its pronounced spirochetostatic action, proves an invaluable weapon in the fight against the scourge that has so often baffled the best efforts of the medical profession.

### THE TREATMENT OF TERATOMA OF THE TESTICLE

Because of the predominance of young age groups in the Navy, malignancy does not assume a place of prominence among pathological conditions seen by medical officers. Nevertheless, a considerable number of cases are treated, and at the Naval Hospital, New York, where many of the cases in the Navy are concentrated in order to have readily available the facilities in treatment found in a great medical center, new views of the treatment of the various sorts of malignancy are at once studied and used. One of the most recent is in the method of handling cases of teratoma of the testicle. In these dangerous cases Dean of the Memorial Hospital, New York, strongly advocates the radiation of the tumor so as to cut off the lymphatics before even biopsy is done. Indeed, *biopsy is strongly contraindicated*, as it produces a rapidly growing fungating tumor. When a patient has a teratomial tumor of the testis and no metastases can be found, the treatment of choice is a thorough irradiation of the testis and abdomen of the same side followed in 4 to 6 weeks by orchidectomy. Several courses of irradiation should follow at short intervals.

Stelle, in the Archives of Surgery (January 1934), in a study of 15 cases from the cancer service of the United States Naval Hospital, New York, draws attention to the importance of prolan A in the urine of patients with the disease as a diagnostic aid, it having been present in all of his cases with either the original tumor or active metastases. He also draws attention to the relative radio-sensitivity of this tumor and the excellent results following radiation.

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### ANNUAL MEETING OF THE ASSOCIATION OF MILITARY SURGEONS

The annual meeting for 1934 of the Association of Military Surgeons is to be held October 8, 9, 10, at Carlisle Barracks, Carlisle, Pa. The Army Medical Field Service School, under the command of Brig. Gen. M. A. DeLaney, will provide facilities for demonstrations of interesting problems in the tactical employment of medical troops, and in field hygiene.

The town of Carlisle is famous as the home of Mollie Pitcher, the heroine of Monmouth, and she is buried in the old graveyard at Carlisle. There is an old stone guard house on the reservation built by Hessian prisoners in 1777. Gettysburg battlefield is not far away, and a tour of it is easily made from the barracks.

There have been two previous meetings at Carlisle, both highly successful, and it is believed that this will equal them in attendance. There will be much of interest to naval medical officers, particularly

in reference to problems likely to arise when serving with Marine Corps units.

#### **SOME NEWLY DISCOVERED PHYSIOLOGICAL EFFECTS OF TOBACCO**

Every user of tobacco is familiar with the feeling of well-being that follows or accompanies a cigarette or cigar and also has experienced the relief from hunger that may be obtained by smoking. In the *Journal of Pharmacology and Experimental Therapeutics*, Cannon, Aub, and Binger describe some studies that explain these facts. They found that with the respiratory quotient above 0.85 and the blood sugar above 0.13 the smoking of a cigarette did not affect either factor. When lower, and especially at the fasting level, there was a quick rise both in the respiratory quotient and blood sugar. This was followed by a gradual decline to the former level. Fatigue, irritability, and hunger are all attended by a low blood sugar, and it appears that minute amounts of nicotine are capable of stimulating the medullary portion of the suprarenal and causes an outpouring of epinephrine and a corresponding hyperglycemia. The slight acceleration of pulse, and rise in blood pressure that follows the use of tobacco are thus also explained.

The effect of tobacco on the human body has been a subject on which there has been little exact knowledge. It is, therefore, gratifying to find that other effects of tobacco are being studied and that some more interesting facts are coming to light. Other workers, Maddock and Collier, for example, have demonstrated vasoconstriction as an effect of smoking a cigarette and their results have been corroborated at the Mayo Clinic both on a series of normal men and patients with thromboangitis obliterans.

Vasoconstriction is an unfavorable effect in nearly any type of arterial disease and it is easy to see how it may cause exacerbations of symptoms and even tissue damage in occlusive types of arteriosclerosis, Buerger's disease, and vasospastic conditions. This confirms general medical opinion based on clinical grounds that tobacco, even if not an etiologic factor in angina pectoris and thromboangitis obliterans, is a factor in causing exacerbations and increasing tissue damage. Two recent workers, Harkavy and Sulzberger, have brought out the possibility of tobacco as an allergic agent, and as the result of skin sensitization studies, believe it is a factor of importance in the causation of Buerger's disease. Sulzberger found 77 percent of patients with this disease reacted positively to extracts of tobacco, while only 26 percent reacted in the control series. Harkavy found 86 percent positive and 20 percent with his controls.

While this work needs further confirmation, it is of great value as indicating a basis for the clinical belief that tobacco is an impor-



tant though probably not the only etiologic agent in thromboangitis obliterans.

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#### **A NEW METHOD OF RESEARCH IN PHYSIOLOGY**

In the March 30, 1934, number of *Science*, the official journal of the American Association for the Advancement of Science, Light and Chaffee describe a new method of electrically stimulating parts of the nervous system by what they describe as "remote control." A small secondary coil of copper wire covered with collodion is implanted at operation in the experimental animal. After healing of the wound, if the animal is placed within the magnetic field of a specially constructed primary circuit induction currents can be produced in the previously placed secondary coil. Thus, as a commentator upon it aptly says, "the apparatus as designed removes the restrictions of time, anaesthesia, and restraint from experimental exploration of functions susceptible to electrical excitation." Already many successful experiments have been made. The collodion-covered coils do not apparently cause irritation or cyst formation. It is believed that this apparatus will be of particular value in the study of the autonomic nervous system and aid in the solution of many puzzling problems relating to the physiology of sleep, sugar and water metabolism, menstruation, temperature control, and gland activity. Though not mentioned by the originators of the method, it should prove of value in pharmacologic investigations.

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#### **PRESBYOPIA AS A MEASURE OF LIFE EXPECTANCY**

The theory that the gradual aging of the lens of the eye and of the other parts of the body proceed in a parallel manner, and that the degree of presbyopia may be taken as an indication of life expectancy, was propounded by the German ophthalmologist, Steinhaus. He has published some interesting studies of this subject which indicate that there is much to favor the truth of this theory. As presbyopia can be measured with considerable exactness, its proof would make available a simple and precise method of measuring the aging process. The advantages to clinicians, the desire of everyone to know the normal duration of their life span, and the practical use to which such a test might be put by insurance companies makes the subject one of unusual interest. The accumulation of a large number of observations over a considerable period is necessary before it can be applied in practice.

**AMERICAN BOARDS OF OTOLARYNGOLOGY AND OPHTHALMOLOGY REDUCE  
EXAMINATION FEE**

The American Board of Otolaryngology has waived the regular application fee of \$50 in the case of applicants from the Medical Corps of the Navy. A fee of \$5 for engraving the certificate will still be required.

The American Board of Ophthalmology also has reduced its fee to \$25 to medical officers of the Navy.

## BOOK NOTICES

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Publishers submitting books for review are requested to address them as follows:

The Editor,  
UNITED STATES NAVAL MEDICAL BULLETIN,  
Bureau of Medicine and Surgery, Navy Department,  
Washington, D.C.  
(For review.)

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**THE MODERN TREATMENT OF SYPHILIS.** *By Joseph Earle Moore, M.D., associate in medicine, The Johns Hopkins University; Physician in charge, Syphilis Division of the Medical Clinic and Assistant Visiting Physician, The Johns Hopkins Hospital, Baltimore.* Charles C. Thomas, Springfield, Ill., 1933. Price \$5.

Without any reservation, this is the very finest thing yet done among modern books on the subject. Which is to say—since the older books, masterly as they may have been in their day, are of little present value in view of our recent new concepts on treatment—that this new work of Moore's is the most valuable volume on treatment we can consult today.

But it is more than a book to consult; it is a book to read and a book that should be read by every medical officer who realizes that syphilis is the most important disease in the Navy. This should include all but a few—a few who had best start in with a more elementary treatise on the general subject of syphilis.

Books on syphilis, heretofore, have been much more comprehensive, with the result that all too little space was left for an adequate discussion of treatment problems.

This book is limited in scope to considerations of treatment, but of necessity includes a great deal about prognosis since prognosis is inseparably linked to treatment in syphilis. Much of the data on treatment has been taken from the records of the cooperative clinical group, a group of the leading syphilis clinics in the United States in association with the United States Public Health Service.

In some 500 pages the author has condensed in a very smoothly readable form, with impressively good logic and sequence, practically all the information of a strictly authoritative sort that is available today for those engaged in the treatment of syphilis. In

the section on neurosyphilis the author has almost done the impossible—translated a wealth of experience into word form. This section is a book in itself, and had it been composed by medical writers less skillful in English and less able in mapping out the material with a good sense of proportions, it might easily have run into a thousand pages.

There are excellent preliminary chapters on the biology of the syphilitic infection and on the pharmacology and toxicology of the antisymphilitic drugs. Fifty pages are then devoted to considerations of treatment of early syphilis, the keynotes being the superiority of continuous over intermittent treatment and of arsphenamine over the other trivalent arsenicals. Here, as in all sections of the book, the statements regarding amounts and kinds of treatment advised are all based on well-established prognosis tables.

The remaining chapters concern such special treatment problems as those in asymptomatic neurosyphilis, latent syphilis, complication of pregnancy, late bone and mucocutaneous syphilis, cardiovascular syphilis, ocular syphilis, congenital syphilis, serological fastness, and neurosyphilis. The particular emphasis in the neurosyphilis section is on the value of fever therapy and its superiority over other methods in the treatment of paresis and taboparesis.

All in all, the book supplies a splendid post graduate course in syphilis therapy, and one cannot but conclude on completing the reading of it that the medical profession as well as all syphilitic patients are enormously indebted to the author and his associates and the publishers who have devoted themselves to the construction of a volume that can occupy the high place in modern medical literature to which this one is assured.

*MODERN CLINICAL SYPHILOLOGY*, by John H. Stokes, M.D.; *Duhring professor of dermatology and syphilology at the School of Medicine, University of Pennsylvania*. 2nd Edition; 1400 pages and 973 illustrations. W. B. Saunders Co., Philadelphia, 1934. Price \$12.

In the new edition there are very extensive additions to this magnificent work on syphilis, one of the foremost in its field and one which American medicine can compare with satisfaction with the best European medical literature on this subject. An entire chapter on relapse and progression has been added and also a world survey of the literature of syphilis. A feature of this book is the many summaries and tabulated arrangements of facts that make both for condensation of knowledge and ease of obtaining it.

Some of the more important features are the newer conceptions regarding reinfection, the reinterpretation of dark field and serological findings, and the extended consideration given to bismuth. The

arsenical reactions are presented from the standpoint of prevention primarily, and detoxification agents are thoroughly covered.

Cardiovascular syphilis, neurosyphilis, the prevention of congenital syphilis by treatment of the pregnant mother, fever therapy, the public health aspects, the control of infectiousness, these are all given comprehensive studies, amounting to almost monographs on the subject. Though no doubt one of the best works on syphilis in any language, Dr. Stokes in his preface modestly states that, "To afford a digest of syphilis from the chancre to paresis, from the pancreas to the hypophysis, from the great-grandparents to the third cousins \* \* \* has been, perhaps, a too ambitious aim. Inevitably, therefore, as in the first edition, there will be unintended omissions, imperfection of emphasis, citations which have been overlooked, and on which correction is invited." This statement, however, only emphasizes the comprehensive character of the book.

**EXTERNAL DISEASES OF THE EYE.** By Donald T. Atkinson, M.D., consulting ophthalmologist to the Santa Rosa Infirmary and the Nix Hospital, San Antonio, Tex. 1934; 704 pages; 479 illustrations. Lea and Febiger, Philadelphia. Price \$7.50.

With so many urging the return of the general practitioner to a place in the sun, there has been an increase of books written by the specialist intended primarily to better enable the ordinary medical man to diagnose and treat the conditions he meets without referring the case to a specialist. We have had recently such books as Beckman's *Treatment in General Practice*, Hertzler's *Surgery of a General Practice*, and a number of others which have been written with this purpose in view. This is real altruism on the part of the specialist who is working to cut down the opportunity to increase the number of his own fees. It is analogous to the position of the medical profession as a whole which has in the field of preventive medicine attempted to lessen the need for medical services.

Dr. Atkinson has devoted an entire book to external conditions of the eye, conditions which can be seen without ophthalmoscopic or other extensive or specialized instrumental examinations. That the work is considered in detail is evident from the size of the book and the large number of illustrations. Many of the latter were drawn from wax models made by the author. Among the important features is the stress laid upon injuries to the lids, sclera, and cornea, all conditions likely to be seen by the general practitioner.

**DISEASES OF THE SKIN.** By Oliver S. Ormsby, M.D.; Clinical Professor and Chairman of the Department of Dermatology, Rush Medical College, University of Chicago. Fourth Edition. 1,288 pages, 619 engravings, and 3 colored plates. Lea and Febiger, Philadelphia, 1934. Price, \$11.50.

This new edition has been largely rewritten and 124 new illustrations have been added. Full descriptions are given of tularemia,

thromboangitis obliterans and a number of other newly discovered pathological entities. There is a very thorough account of the histopathology of the skin by Dr. Finnerud, of Rush Medical College. Treatment is emphasized throughout including special treatments, such as radiotherapy, Grenz rays, radium, light therapy, carbon dioxide snow, and vaccines. There are a large number of prescriptions and formulas given.

**ESSENTIALS OF MEDICAL ELECTRICITY.** By E. P. Cumberbatch, Medical Officer in Charge, Electrical Department, St. Bartholomews Hospital, London. Seventh edition, 15 plates and 132 other illustrations. Henry Kimpton, London. Price, \$2.75.

This manual begins with a rather detailed description of apparatus followed by a chapter on the subject of the human body as a conductor of electricity. The subject of electro-chemical cauterization, a practical subject for both the specialist and the general practitioner, is then carefully described, the technique being given with considerable detail. The action of the galvanic current, its therapeutic uses, its application in the introduction of therapeutic ions, and the treatment of paralysis follow. The electric testing reactions are described with unusual simplicity and clearness, and this chapter is worth the price of the book. The subject of diathermy, diathermic coagulation, electro desiccation or "fulguration", as it is more commonly called in this country, and the use of static electricity, are described with care. There is a much too brief chapter on arc cutting currents in surgery. It concludes with an "Index of Electrical Treatment", really a sort of dictionary of the subject and a very useful ready reference feature.

**A TEXTBOOK OF PHARMACOLOGY AND THERAPEUTICS**, by Arthur R. Cushny, late professor of materia medica and pharmacology in the University of Edinburgh. Tenth edition, 786 pages, 75 engravings. Lea & Febiger, Philadelphia. Price, \$6.50.

This edition of a book that has been a standard for over 30 years has been very thoroughly revised by Prof. C. W. Edmunds, professor of materia medica and therapeutics at the University of Michigan, and Dr. J. A. Gunn, the professor of pharmacology at Oxford. The benefit of the best of American and English experience in therapeutics and pharmacology has thus been available in producing this edition.

The arrangement followed in discussing the action and the uses of drugs is one of the reasons for the great popularity of this work for more than 3 decades. Following the description of the pharmacologic action of each drug is a discussion of their therapeutic use, and action and value in treatment are thus closely linked together. Furthermore, this is immediately followed by a list of the

preparations of the drug. The whole arrangement is very simple, yet eminently practical and usable.

With a work just off the press it should be unnecessary to say that the latest advances are given much space. The subjects of vitamins, bismuth in the treatment of syphilis, the new chemistry of digitalis, iron, liver, and stomach preparations in primary anemia, and the new hypnotics are thoroughly covered. It is a useful, medium-sized, medium-priced book. An interesting feature is a biographical note of Cushny, who, it must be remembered, was one of the great medical men of our generation.





# THE DIVISION OF PREVENTIVE MEDICINE

S. S. COOK, Lieutenant Commander, Medical Corps, United States Navy, in Charge

## TOXIC EFFECTS OF ARSENICAL COMPOUNDS AS ADMINISTERED IN THE UNITED STATES NAVY WITH ESPECIAL REFERENCE TO ARSENICAL DERMATITIS

By S. S. COOK, Lieutenant Commander, Medical Corps, United States Navy, and H. D. CAMPBELL, Chief Pharmacist's Mate, United States Navy

For the past 10 years medical officers of the Navy have been required to submit monthly reports to the Bureau of Medicine and Surgery of the number of doses of arsenicals administered and the reactions subsequent thereto. This information, including that for 1932, has been compiled and published in the United States Naval Medical Bulletins of September 1925, January 1927, January 1929, July 1930, October 1931, October 1932, April 1933, and October 1933.

In table I are shown the number of doses of each arsenical administered in the year 1933, the reactions which occurred, and similar data for the 9-year period 1925-33. It is noted that in 1933 there was 1 reaction to 1,543 doses and 1 death to 20,947 doses. For the 9-year period 1925-33 there was 1 reaction to 1,368 doses and 1 death to 24,705 doses.

TABLE I.—Arsenicals, United States Navy, 1933 and 1925-33—Type of drug, reactions, and ratio of doses to reactions

	Number of doses administered	Mild reactions	Severe reactions	Fatal reactions	Total reactions	Ratio of reactions to doses, 1 reaction to—	Ratio of deaths to doses, 1 death to—
<b>Year 1933:</b>							
Arsphenamine.....	89	0	0	0	0	0	0
Neoarsphenamine.....	138,490	37	48	7	92	1,505	19,784
Tryparsamide.....	4,679	0	0	0	0	0	0
Sulpharsphenamine.....	2,921	2	0	0	2	1,461	0
Silver arsphenamine.....	34	0	1	0	1	34	0
Bismarsen.....	84	0	0	0	0	0	0
Acetarsons.....	332	0	0	0	0	0	0
<b>Total.....</b>	<b>146,629</b>	<b>39</b>	<b>49</b>	<b>7</b>	<b>95</b>	<b>1,543</b>	<b>20,947</b>
<b>9-year period, 1925-33:</b>							
Arsphenamine.....	30,652	25	13	1	39	786	30,652
Neoarsphenamine.....	762,342	345	187	33	565	1,349	23,101
Tryparsamide.....	31,187	1	0	0	1	31,187	0
Sulpharsphenamine.....	14,655	5	3	0	8	1,832	0
Silver arsphenamine <sup>1</sup> .....	224	0	1	0	1	224	0
Bismarsen <sup>2</sup> .....	142	0	0	0	0	0	0
Acetarsons <sup>3</sup> .....	779	0	0	0	0	0	0
<b>Total.....</b>	<b>839,981</b>	<b>376</b>	<b>204</b>	<b>34</b>	<b>614</b>	<b>1,368</b>	<b>24,705</b>

<sup>1</sup> First administrations were during the year 1931.

<sup>2</sup> First administrations were during the year 1929.

<sup>3</sup> First administrations were during the year 1932.

The 95 reactions which occurred in 1933 have been classified as to type, as follows:

Vasomotor phenomena (nitritoid anaphylactoid, etc.)	36
Arsenical dermatitis	33
Table reactions	11
Liver damage	6
Acute renal damage	4
Jarisch-Herxheimer	2
Aplastic anemia	1
Encephalitis hemorrhagica	1
Reaction of minor importance with insufficient data for classification	1
<b>Total</b>	<b>95</b>

From this table it may be seen that the most frequent reactions are those that are classified as vasomotor phenomena and as arsenical dermatitis. Slightly more than one-third of the reactions were observed to be some form of dermatitis.

In this article will appear a brief summary of the clinical history of each of the 33 cases of arsenical dermatitis and detailed reports of the autopsy findings in the 2 fatal cases. Consideration will also be given to the significance of certain skin manifestations and to treatment both abortive and curative.

#### ARSENICAL DERMATITIS

The 33 cases of arsenical dermatitis reported in 1933 were classified as 8 mild reactions, 22 severe, and 2 fatal. The type of lesion was exfoliative, 21; erythematous, 3; papular, 3; herpes, 1; macular, 1; macular-erythematous, 1; morbilliform, 1; splotchy rash, 1; and urticaria, 1.

#### MILD REACTIONS

The reactions occurred in 5 instances during the first course of treatment, in 1 during the second course, 1 in the third course, and 1 in the fourth course. Of the five reactions during the first course, none followed the first injection.

The interval between injection and appearance of symptoms varied from 4 hours to 5 days.

The length of time required for recovery varied from 2 to 10 days.

A brief history of each case is cited. One of the mild reactions is shown in the group of severe reactions as it occurred in an individual who had previously suffered a severe reaction.

(74—1933) A patient who was infected in February 1933 began treatment on March 11 with a 0.3-gram dose of neoarsphenamine. On March 17 he received a 0.5-gram injection and 4 days later

developed a fine pink macular rash over the entire body. He also complained of headache, nausea, myalgia, and general weakness. He responded readily to treatment and recovered in 9 days.

(75—1933) A patient who was infected in May 1933 began treatment on July 6 when he was given a 0.225-gram intravenous injection of neoarsphenamine. On July 13 he received 0.45 gram and on July 20 a 0.6-gram injection. Five days later he developed marked urticaria and recovered in 3 days.

(76—1933) A patient who reported to the sick bay in December 1932 with a primary lesion, adenopathy and four-plus Kahn, began treatment on December 12. He apparently received treatment between then and September 19, 1933, although the amounts are not stated except for a notation of 20 injections. In November what appears to have been a third course of treatment was started. This was continued until December 19 for a total dosage of 3.06 grams of neoarsphenamine. On the following day he was thought to have catarrhal fever. Within 2 days a fine miliary papular rash was seen. This disappeared in 2 days.

(77—1933) A patient whose diagnosis of syphilis was established on November 14, 1933, received his first injection of neoarsphenamine on November 20. After an initial dose of 0.3 gram he received semi-weekly doses of 0.45 grams until December 18. On December 22 he was admitted to the sick list with catarrhal fever, the symptoms of which were chills, temperature 104° F., general malaise, headache, and coryza. These symptoms subsided rapidly and on December 28 arsenical treatment was resumed, with the administration of a 0.3-gram dose of neoarsphenamine. The next morning there was a rash on his body which consisted of bright red macules on the chest, back, arms, and legs. There was slight itching but no constitutional symptoms. Recovery in 5 days.

(78, 79—1933) A patient who was exposed on February 15, 1933, presented himself for treatment on March 14. At this time he had inguinal adenopathy, a positive dark field and a two plus Kahn blood test. Treatment was begun on March 16, with the administration of 0.3 gram of neoarsphenamine, and followed by 0.45-gram injections on March 18, 20, and 23. He received 1.65 grams in 8 days, an average of 206 milligrams per day.

About 4 hours after the last injection he became nauseated, had a chill and then a temperature of 103° F. A splotchy skin rash, which became generalized, was also noted. All symptoms, including the rash, disappeared in 7 days and treatment was resumed.

He was given a 0.2-gram injection which was followed in 4 hours by headache and return of the rash. There was itching and burning of the skin for 2 days but no exfoliation. Recovery in 10 days.

(80—1933) A patient who was infected in November 1932 received an unstated amount of neoarsphenamine in November and December. From March 9, 1933, to May 12 and from July 15 to September 7 he again received an unstated amount of neoarsphenamine. On December 9, 1933, he began, what appears to have been, a fourth course with the administration of a 0.3-gram injection. In 44 hours he developed general malaise and a fine papular eruption covering the entire body. The rash disappeared in 2 days. Two weeks later a 0.1-gram injection was followed by a return of the rash in a mild form.

#### SEVERE REACTIONS

The 22 reactions occurred in 13 instances during the first course of treatment, in 6 during the second, in 1 during the third, and in 2 during the fourth.

The interval between injection and appearance of symptoms was quite variable. In one instance evidence of skin irritation was noted within 2 hours, while the longest interval was 18 days. A majority of the patients presented symptoms in 2 to 4 days.

It appears difficult to predict the duration of an attack of severe dermatitis. Of the 22 cases 6 recovered in less than a month, while 5 were ill for more than 4 months. One individual who was admitted to the sick list on September 16, 1933, had not recovered June 26, 1934.

(51—1933) A patient who was infected on May 10, 1933, began treatment with neoarsphenamine on August 1. Eight intravenous injections of 0.6 gram each were given between that date and September 19. He noted generalized aching on two occasions but did not report to the sick bay. On October 24 he was given an intravenous injection of 0.6 gram which was followed within 24 hours by itching which progressed to scaling and finally desquamation. Recovery occurred in 16 days.

(52—1933) A patient whose diagnosis of syphilis was established on July 19, 1933, commenced treatment the following day. Up to the completion of the course on September 16 he received 4.8 grams of neoarsphenamine, an average of 81 milligrams per day. About 2 hours after the injection of September 16 he noted a rash on the arms which progressed to a maculo-papular eruption over the body and ended in rapid desquamation. Recovery in 20 days.

(53—1933) A patient who was infected in December 1932 began treatment in January 1933, and continued until February 16, 3 grams of neoarsphenamine being given in 45 days. Four days after the injection of February 16 he complained of a skin rash which progressed to a generalized exfoliative dermatitis. Recovery in 39 days.

(54—1933) A patient who was exposed in December 1932 was seen on January 17, 1933, at which time he had macular syphilis and mucous patches. In the first course of treatment which was concluded on February 25 he received 3.9 grams of neoarsphenamine. Three days later a maculo-papular eruption developed and involved the trunk and extremities. A characteristic and severe exfoliative dermatitis ensued. Recovery in 86 days.

(55—1933) A patient who was infected early in January 1933 reported to the sick bay with secondary syphilis on February 26. Treatment was begun on March 2 and continued until April 14, during which time he received 5.25 grams of neoarsphenamine. On April 19 dermatitis was observed and progressed to a generalized maculo-papular eruption and exfoliation. Recovery in 42 days.

(56—1933) A patient was infected July 8, 1933, and treatment with neoarsphenamine begun on August 1. Treatment was continued until September 5, during which time he received 2.75 grams, an average of 76 milligrams per day. The following day he had a diffuse erythematous vesiculo-papular eruption with pruritus. A severe exfoliative dermatitis developed on October 10. A patch test for arsenic sensitivity was strongly positive. On January 9, 1934, he was described as feeling and looking well except for a dry, harsh skin. On January 23 a patch test for arsenic was positive. Recovery in 175 days.

(57—1933) A patient who was exposed on January 5, 1933, developed a penile lesion which was found to contain *Treponema pallidum* on February 20. He received 11 injections of neoarsphenamine from February 25 to April 22.

A second course of arsenical treatment was begun on August 10 and continued until September 28 during which time he received 3.45 grams of neoarsphenamine, an average of 69 milligrams per day. Seven days later he reported an itching rash which involved the lower abdomen and thighs. A generalized exfoliative dermatitis developed which terminated in desquamation and recovery in 75 days.

(58—1933) A patient with a history of a genital lesion in 1914 was first seen in April 1933. He was admitted to a naval hospital with hemorrhoids and a routine Kahn blood test was 4 plus. He refused antiluetic treatment. On admission to the same hospital in August 1933 positive findings were chronically diseased tonsils, hypotension 104/54, and Kahn blood test 4 plus. On August 19 treatment was instituted with the intravenous administration of 0.45 gram of neoarsphenamine. This was followed by weekly injections of 0.9-gram doses until September 28, a total of 5.85 grams being given in 41 days, an average of 143 milligrams per day. With the excep-

tion of nausea and headache after the fourth injection, no reactions were noted during the course. A spinal puncture was done on September 5 and the fluid found to be under increased pressure with a cell count of 840, globulin positive, Kahn 4 plus, sugar 46 milligrams per 100 cc, and colloidal gold curve 0123444321. On October 1, 3 days after the last injection, a patchy weeping eruption was seen on the right ankle. A generalized vesiculo-papular dermatitis developed and terminated in desquamation. Recovery in 45 days.

(59—1933) A patient who was infected in April 1930 began treatment on June 2 and completed his first course on June 26. In this period of 24 days he received 4.8 grams of neoarsphenamine, an average of 200 milligrams per day. In the second course, August 11, 1930, to September 17, 1930, he received 4.8 grams of the drug, an average of 130 milligrams per day. In the third course, March 9, 1931, to April 29, 1931, he received 4.8 grams of the drug, an average of 94 milligrams per day. On November 4, 1933, his fourth course of treatment was instituted with the administration of 0.3 gram of the drug. Five days later he developed an intense itching dermatitis of the face which desquamated. Recovery in 26 days.

(60—1933) A patient who was infected about July 9, 1933, was given a diagnosis of syphilis on July 19 because of (1) *Treponema pallidum* in ulcer on glans penis, (2) palpable lymph nodes, (3) headache, (4) Kahn blood test 4 plus.

Three intramuscular injections of bismosol were given prior to beginning arsenical treatment. On July 27 he was given his first injection of neoarsphenamine, which was 0.3 gram. This was followed by 12 injections of 0.45 gram each, the last on September 11. On September 7 he noticed a few pimples on the forehead which appeared to be blackheads. On September 12 he noticed that his face was itchy. A patch test performed with neoarsphenamine was found to be negative. On September 16 there were pustules on the nose and chin and some edema around the eyes. A severe dermatitis ensued with severe secondary infection, abscess formation, and profound toxemia. He showed definite improvement in about 2 months but still had several small abscesses.

Neurologic examination on November 27: Patient complains of sharp pains in toes and walks with shuffling gait. Babinski, negative; ankle clonus left foot; knee jerks barely perceptible; tendo achillis reflexes diminished, left more so than right. Romberg, distinct sway with loss of equilibrium to right posteriorly; pupils react promptly to light and distance, slight irregularity of right. On January 14 patch test with neoarsphenamine was positive. The patient developed a severe multiple neuritis which is still present June 23, 1934.

(61—1933) A patient, whose diagnosis of syphilis was based on the findings of *Treponema pallidum* in a leg ulcer on February 17, 1933, received treatment immediately. This course consisted of 2.75 grams in a period of 43 days, an average of 64 milligrams per day. Three days after the last injection he developed a generalized itching which was followed by the appearance of a diffuse maculo-papular rash involving the head, trunk, and extremities. He had experienced several slight attacks of itching following previous injections but did not report his condition to the medical officer. Accompanying physical findings were an enlarged liver, leukopenia, white blood count 3,500, a trace of albumin and an occasional red blood cell in the urine. Recovery in 26 days.

(62—1933) A patient who was exposed on October 6, 1922, was given a diagnosis of syphilis on November 27, 1922, because of a 4 plus Wassermann blood test. Treatment: First course, November 30, 1922, to January 9, 1923, amount not stated. Second course, in 1923; February 13 and 20, injections of salvarsan of 0.45 gram each, February 27, an injection of 0.6 gram. A severe attack of exfoliative dermatitis developed in March and continued until October, being complicated by purulent cellulitis of the right arm. He was sent to duty on October 31, 1923, after 242 sick days.

There was a recurrence of symptoms on February 20, 1924, when the patient was seen with edema of the eyelids and a vesicular eruption of the face. This condition terminated on April 7, after 46 sick days. On February 2, 1927, almost 3 years later, he presented himself for treatment and was found to have generalized vesicular rash. There were no constitutional symptoms, and the rash which disappeared in 9 days was thought to be miliaria. On February 17 an intravenous injection of 0.45 gram neoarsphenamine did not produce any reaction. On May 18, 1932, he reported to the medical officer because of burning and itching of the skin of the neck, shoulders, and chest. There were small areas of thickened, scaly skin on the region of the neck and some exfoliation of the skin of the chest and lower extremities. He later developed a desquamating dermatitis which was chiefly seen on the hands and feet, but was also present on the legs. This condition, which cleared up in 21 days, was diagnosed trichophytosis.

In July and October 1932 Kahn blood tests were positive.

On January 11, 1933, another course of arsenical treatment was begun and he received 1.65 grams of neoarsphenamine in 19 days, an average of 87 milligrams per day. He received his last injection on February 1 and on February 2 he reported with a generalized dermatitis. This condition took on the appearance of a weeping desquamation, and was accompanied by fever and prostration. Recovery in 76 days.

(63—1933) A patient who was given a diagnosis of syphilis on March 6, 1933, received injections of 0.6 gram neoarsphenamine on March 14, 21, and 27. He experienced a high fever after the injection of March 21 and on March 29 a papular rash appeared on his chest. Four days later the rash had become general and there was jaundice. On April 15 white crusts were seen on the soles of his feet, his skin was deeply jaundiced, superficial lymphatic glands were palpable but soft, and on the trunk were purpuric spots.

Laboratory examination—red blood count 5,580,000, white blood count 25,100, hemoglobin 100 percent; platelets 19,500, reticulocytes 2 in 500 red cells, band forms 3 percent, segmented 48 percent, lymphocytes 14 percent, and eosinophiles 35 percent. Kahn blood test, negative. Recovery in 72 days.

(64—1933) A patient who was infected early in July 1933 began treatment on July 15 when he received a 0.4-gram injection. Treatment was continued until October 23, the patient receiving 5.8 grams of neoarsphenamine in 80 days, an average of 71 milligrams per day. A second course of treatment was begun on November 28, the patient receiving 0.3 gram of neoarsphenamine. Immediately he became nauseated and vomited several times. When he reported to the medical officer 6 hours later his temperature was 103.4, pulse 100, respiration 25, and there was an urticarial-like rash on his face and body. During the following 2 weeks the skin of his neck, chest, back, and arms exfoliated. Recovery in 17 days.

(65—1933) A patient who was found to have syphilis on July 28, 1932, began treatment that day and continued until October 13, during which time he received nine injections of neoarsphenamine, totaling 4.65 grams. He developed a moderate urticaria after the first injection which was promptly relieved by an injection of adrenalin hydrochloride. Treatment was suspended for 3 weeks and then resumed without any reactions after the remaining injections of the course. On November 3 a second course of treatment was commenced and continued until 3.75 grams were given. The number and size of injections were not stated.

About 10 months later, August 3, 1933, he started a third course of treatment. He received injections on August 3, 10, and 17 for a total of 0.9 gram in 15 days, an average of 60 milligrams per day. Two days after the last injection he awoke with an erythematous rash, urticarial in type, which covered his face, neck, body, and extremities. He complained of itching, headache, and dizziness. Recovery in 21 days.

(66—1933) A patient whose diagnosis of syphilis was made on April 15, 1933, began treatment immediately and received weekly injections of neoarsphenamine until June 7. In this period of 54 days he received 3.6 grams of the drug, an average of 67 milligrams



per day. On June 28, or 21 days after the last injection of neoarsphenamine, he was found to have an acneiform eruption involving the chest, scalp, and scrotal region. There was some itching which was increased by exposure to sunlight. The condition having responded to local treatment, a second course of arsenical treatment was begun on July 11 with the injection of 0.3 gram of neoarsphenamine. It was noted that this injection and also those of July 18, 25, August 1 and 8 were followed by an aggravation of the skin condition. One week after the last injection, namely, that of August 8, an examination revealed a moderately severe generalized exfoliative dermatitis. This condition responded very slowly to treatment and he still had a slight dermatitis when he was sent to duty after 118 sick days.

(67, 68—1933) This patient in whom 2 reactions were reported was given a diagnosis of syphilis on January 26, 1933. Treatment: February 7, 1933, to March 28, 1933, eight injections of neoarsphenamine, total 4.8 grams, an average of 97 milligrams per day. On April 20, 1933, he received a 0.35-gram injection of neoarsphenamine and within an hour had a chill, headache, and temperature of 103° F. These symptoms disappeared in 2 hours. Two days later a few pustules appeared on the lips but disappeared in 2 days. A week later, May 1, he reported for treatment because of a dry, scaling skin. Except for slight gastric distress there were no constitutional symptoms. He continued to have some redness and desquamation of the skin until June 20 when he was described as having a dull reddish macular eruption, very similar to luetic secondaries, over his entire body. On July 21, 90 days later, he had recovered.

On October 31, 1933, an intravenous injection of 0.25 gram of neoarsphenamine was followed in 3 hours by an itching skin and generalized erythema. This disappeared in 36 hours.

(69, 70, 71—1933) This patient in whom three reactions were reported was probably infected in China in March 1933. The diagnosis of syphilis, which was based on two positive Kahn blood tests and a primary lesion on the lip, was established in April 1933. On April 14 he received 0.3 gram of neoarsphenamine, which was followed in 9 hours by a chill, fever, and nausea. The next morning he had labial herpes. At the end of a week the herpes had disappeared except for a few remaining crusts.

Treatment was resumed on April 21 with the administration of 0.05 gram of neoarsphenamine at 10:05 a.m. and 0.35 gram at 10:35 a.m. Thus he received 0.7 gram of the drug in 8 days, an average of 88 milligrams per day. Within 9 hours he had a chill, followed by elevation of temperature to 102° F., and vomiting. The next day he complained of nausea and had a temperature of 100° F. On April 23, 2 days after the two injections, an erythematous rash

appeared on the upper chest and shoulders. This rash, which itched intensely, disappeared in 6 days.

On April 28 he was given an injection of 0.5 gram sodium thio-sulphate and 0.3 gram of neoarsphenamine. It was administered at 10:30 a.m. and in about 3 hours he had a slight chill, nausea, and temperature of 103° F. During the night he vomited several times, and about midnight noticed that his face was swollen. The next morning his face and eyelids were edematous and the entire body was covered with an intense itching erythematous rash. Within 3 days the edema and rash had practically disappeared.

On May 4 he was thought to have recovered and was sent to duty. On May 6 he was awakened during the night by an itching and swelling of his face. The next morning the skin of the upper portion of his body was acutely inflamed and edematous. His condition became markedly worse with the development of a generalized wet dermatitis. In about 2 weeks the acute symptoms subsided and desquamation set in.

To duty well, except for slight irritation of the hands, in 48 days.

(72—1933) A patient who was infected in September 1931 began his first course of treatment on October 1, 1931. In this course he received seven weekly injections of neoarsphenamine for a total of 3.9 grams in 45 days, an average of 87 milligrams per day. He developed an exfoliative dermatitis 5 days later which resulted in 101 sick days. (Case No. 46—1931, U.S. Naval Medical Bulletin, April, 1933, vol. 31, no. 2, p. 218.) On June 24, 1933, nearly 16 months later, he was started on his second course of arsenical treatment, receiving 0.3 gram of neoarsphenamine. Within 6 hours his skin became red and in 2 days a generalized exfoliative dermatitis had developed. Recovery in 76 days.

He suffered a relapse 5 days later and was sent to a hospital where he remained 91 days before recovery was complete.

(73—1933) A patient whose time and place of infection was unknown developed a chancre near the anus. The diagnosis of syphilis on May 25, 1933 was based on a positive dark field and a positive Kahn blood test. His first injection, May 25, consisted of 0.3 gram and the four succeeding weekly injections, 0.5 gram each. After the fifth injection he fainted. Because of this symptom the size of the dose was reduced for the next six injections to 0.3 gram each, and each injection was followed by 1 cc of adrenalin. He had abdominal cramps after each injection and felt shaky for the remainder of the day. In the first course which was completed on August 8, 1933, he received 4.1 grams of the drug.

On September 19, 1933, the second course was begun and continued as 0.3 gram administered weekly until October 24. Total 1.9 grams in 36 days, an average of 53 milligrams per day.

The course was interrupted because the patient went on leave on October 28. While on leave and 18 days after his last injection he noticed a rash under his arms. Upon returning from leave on December 5 he reported that he had suffered with a rash all over his body and face. Examination revealed the presence of generalized erythema associated with desquamation, a few papules and an occasional pustule. Recovery in 62 days.

(81—1933) A patient whose diagnosis of syphilis was established on February 6, 1933, received arsenical treatment as follows:

	Gram
Feb. 6, neoarsphenamine-----	0.3
Feb. 9, neoarsphenamine-----	.45
Feb. 13, neoarsphenamine-----	.45
Feb. 23, neoarsphenamine-----	.3
Mar. 2, silver arsphenamine-----	.125
Mar. 6, silver arsphenamine-----	.25

The change from neoarsphenamine to silver arsphenamine was made because he had not tolerated the neoarsphenamine very well, there being a mild reaction after each of the injections of neoarsphenamine.

On March 10 a scarlatinal-like rash appeared and progressed to the development of a generalized exfoliative dermatitis. Recovery in 46 days.

#### FATAL REACTIONS

(49—1933) A patient who was infected on September 20, 1932, began treatment on January 13, 1933, with the administration of 0.3 gram neoarsphenamine. This was followed by five weekly injections of 0.45 gram each, the last being given on February 17. Three days later he reported to the sick bay with a fine macular eruption on the exterior surfaces of both arms and on the trunk. His condition became worse, and he was transferred to a naval hospital on February 24.

He was admitted to hospital February 24, 1933, with diagnosis "Poisoning, acute (neoarsphenamine)." One week prior to this date he had received the sixth injection of neoarsphenamine. Shortly afterward there developed generalized swelling and dermatitis of entire body. On admission there was a well-marked exfoliative dermatitis of the entire body. The eyes were swollen shut, the patient was conscious and rational. He was taking fluids freely and doing well until the morning of March 6, 1933, when he developed an acute nephritis, refused fluids and food, temperature rose to 106° F., pulse rate 132. He was given intravenous medications, proctoclysis, and liquids as he would take them. He grew progressively worse and died on March 7, 1933.

*Report of autopsy.*—Entire body covered with a desquamating skin. Skin was markedly edematous and rigor mortis had set in. Eyes were open; conjunctiva everted both eyes. Many cracks were open on the face between the desquamating plaques. Midline incision: Lungs not adherent. Both bases light color. Marked hyperplasia of all mucous linings. Heart small and valves thickened. Aorta: Many glistening, elevated plaques. Spleen greatly enlarged, capsule loose, wrinkled, not adherent. No mottling but almost black in color. Liver greatly enlarged; capsule adherent; some hemorrhages beneath the capsule. Kidneys, both soft and flabby, cut with difficulty; dark purple in color with extensive mottling. Entire gastrointestinal tract filled with capillary hemorrhage. Brain not examined.

(50-1933) A patient whose date of infection was unknown was given a diagnosis of syphilis on February 23, 1933, because of a four-plus Kahn blood test, mucous patches on the soft palate, and a generalized faint macular rash. Treatment was started on February 23 and continued until March 28. In this period of 34 days he received 4.5 grams of neoarsphenamine, an average of 132 milligrams per day. No reaction was noted until April 12, 15 days later, when the patient was admitted to the sick list with a temperature of 103.2° F. and a severe headache. He gave a history of having noticed a few vesicles and papules about his lips a few weeks previously. He became rapidly worse with the development of a severe exfoliative dermatitis. He developed pneumonia and died on April 27.

*Autopsy findings.*—The body is that of an Hawaiian about 40 years of age. Rigor mortis is moderately developed.

Head: Pupils equal and regular, moderately dilated. Ears and nose negative. Mouth, peeling of the mucous membrane of the lips is extensive but superficial. Skin over the entire body shows exfoliative dermatitis, most marked over the upper part of the body, and on the posterior surface.

Lungs: Firm and elastic to the touch, both appear of about the same consistency, the right being somewhat more marked. Recent thin bands of adhesions present over the left lung anteriorly (the thin anterior margin feebly adherent to the pericardium) and two firmer and older bands over the lateral aspect of the right base. Upon being cut, an unusual amount of fluid exuded from the cut surfaces. This was more marked in the upper part of the lungs. The lower portion of the lungs were less fluid, very dark in color, and of leathery consistence. Patches of broncho-pneumonia are present in both lungs, more marked in the right. The pulmonary arteries and veins do not show thrombosis or emboli. Acute congestion is pres-

ent underneath the parietal layer of the pleuræ. The venous congestion is present in all veins and is more marked in the larger veins all over the body, especially as they leave the viscera. There is a slightly increased amount of fluid in the free pleural space. The same is true of the peritoneal fluid. Sections of the lungs do not sink to bottom in water, but do show a great loss in air containing vesicular capacity. Superficial punctiform hemorrhagic spots are seen over the entire surfaces.

**Heart:** The heart is small. The veins on its surface are distended and the coronary arteries show several slight atheromatous plaques. The color of the myocardium is deep and brownish. The musculature is quite friable. The valves are free from pathology. There are a few clots of recent origin within the heart.

**Liver:** The liver is enlarged and congested. Acute fatty and parenchymatous degenerative changes are present. The lower lobules show up clearly through Glisson's capsule. Portal vein is greatly distended. Gall bladder is moderately distended with bile, its walls appearing normal. The right and left bile ducts show a low union close to the cystic duct.

**Spleen:** Dark, slightly enlarged, pulpy substance liquid and very friable.

**Pancreas:** Congestion throughout. The tissue is firm and little other change is seen grossly.

**Kidneys:** Both are small, very dark in color, and edematous. The latter shows when the kidneys are sectioned. The parenchyma is seen bulging outward from beneath the kidney capsule, which is stripped with ease, showing, however, slight adhesions to parenchyma. The cortex maintains the usual normal ratio to the medulla. The latter is almost black in color. A diffuse granular change is seen in a cut surface, pointing to an acute and subacute nephritis in an early stage. Adrenal capsules, congested, otherwise appear normal.

**Stomach:** The stomach is distended, mucosa shows punctiform hemorrhage. Duodenum and upper half of the jejunum show superficial ulcerations on the mucosal surface. These ulcerations are superficial and diffusely irregular. Minute punctiform hemorrhagic spots are seen in mucosa and submucosa.

*Anatomical diagnosis.*—1. Extensive edema of both lungs and lobular pneumonia. 2. Parenchymatous degenerative changes in all viscera. 3. Toxemia. Microscopically, the gross findings are corroborated, with unmistakable evidence of active lues, and various parenchymatous degenerative changes.

*Treatment.*—The treatment of arsenical dermatitis is admittedly difficult and frequently unsatisfactory. Syphilographers agree that dermatitis will occasionally develop despite all efforts to the con-

trary. However, there are some well-established principles to be followed in the effort to avoid this serious complication. Stokes in his *Modern Clinical Syphilology* summarizes the symptoms and signs to be looked for and regarded as warnings of danger. They are:

#### WARNINGS OF TROUBLE WITH OR FROM THE SKIN

##### GENERAL

1. A history of irritable skin—trouble with soaps, cosmetics, sunburn.
2. The seborrheic state—dandruff (marked), oily skin, acne (or its scars), presternal and interscapular patches of scaling dermatitis.
3. The allergic state—a history of symptoms of asthma, hay fever, repeated attacks of hives.
4. The "vagotonic" or "high-strung" nervous state—red face and neck, blue hands and feet, "inward nervousness."
5. A history of eczema, personal or familial.
6. A history of known specific drug sensitivities. Local reaction to iodine, etc.
7. A high carbohydrate diet or alcoholism.
8. A heavy load of focal infections.
9. An acute infection or exposure to cold (Harrison).
10. Marked repeated vascular and gastro-intestinal reactions, evidence of poor tolerance in general, rising nervous irritability.

##### SPECIAL

1. Itching on the day following injection. Never disregard it, especially with (2).
2. Stippled red rash, flexures, face and neck. Transient at outset. Inquire for it.
3. Edema of eyelids.
4. Chill and fever following arsphenamine (eighth-day erythema) with a florid rash fourth to eighth day.
5. Patches of dermatitis or "eczema", recent or long standing. Examine extremities, groins, hands especially. May also be dermatophytic or examples of "fixed arsphenamine exanthem."
6. Large subcutaneous suggillations and nontraumatic black and blue spots.
7. Purpura, especially noticeable about flexures, wrists and ankles, abdomen, mucosæ.
8. Pallor.
9. Jaundice.
10. Stomatitis (arsenical type).
11. Blood count. Rise in eosinophils, drop in leukocytes, erythrocytes, platelets, immature red cells in smears.

Stokes thinks certain procedures should be carried out in an attempt to abort a threatened attack, and outlines them as follows:

#### THE ATTEMPT TO ABORT A DERMATITIS

1. All specific treatment instantly suspended.
2. A complete blood count.
3. Sodium thiosulphate intravenously, 0.5, 0.75, 1 gm on three successive or on alternate days for three injections, continuance depending on reaction and response.

4. Additional well-recommended measures for alternating use:
  - (a) Bleeding (once) 200-400 cc (Harrison).
  - (b) Insulin, 5 to 10 units subcutaneously, glucose solution 25 to 50 percent, 20 cc intravenously, once or twice daily or on alternate days.
  - (c) Calcium gluconate, 10 cc of a 10-percent solution intramuscularly or intravenously (very slowly) once daily or on alternate days, for 3 or 4 successive doses (Karrenberg and Gerwig).
  - (d) Quinine, 20-30 grains daily (Harrison).
  - (e) Liver extract by mouth or intravenously (Spiehoff), still experimental.
5. Removal of all surface irritants from the skin (mercurial ointment, iodine, etc.).
6. Rest in bed, hospitalization preferred. Air-moistened room.
7. Avoid all chilling and keep respiratory infections away.
8. A mild saline or alkaline laxative unless diarrheic. Do not purge.
9. High saline enema.
10. Fischer's solution per rectum, 20-drop proctoclysis, 2 hours on, 1 hour off, unless diarrheic.
11. Low carbohydrate, high protein and fat diet.
12. Starch bath if itching is severe, followed by oily lotion (base of olive oil and lime water, equal parts) to be used only if no chilling or lividity.
13. No tampering with focal infections.
14. No exposure to *erythema* doses of ultraviolet light.

The treatment of a fully established case of dermatitis is well described by Stokes:

#### MANAGEMENT OF THE FULLY ESTABLISHED CASE OF DERMATITIS

1. Keep up nutrition by a full soft diet and persuasion.
2. Keep sources of irritation and anxiety away. Systematic and sympathetic encouragement.
3. Use every precaution to keep infections and carriers of infections, especially respiratory infections, away.
4. Nurses should wear rubber gloves, preferably elbow length, in handling patient, and wash any exposed parts of their hands or forearms with tincture of green soap.
5. Keep bedding clean, changing daily.
6. Give a colloid bath two to four times a day, 10 to 30 minutes, according to strength of patient. This is the best relief for itching. Bathroom should be part of suite if possible, and special care must be taken to avoid chilling or exposure. Last bath at bedtime. Optimum bath temperature 95° F., but may have to be warmer for chilly patients. Nurse must never leave patient alone in bath.
7. Grease the skin *at once* on drying (patting, not rubbing) after bath. Do this before leaving bathroom.
8. Lassar's paste without salicylic acid, rose ointment, borated or not, olive oil and lime-water emulsion may be used to suit the individual case. In some refractory cases goose grease is very acceptable later.
9. Cover patient according to his wishes, to prevent chilling in bed.
10. Keep air in room warm (75° to 80° F.) and moist.
11. Keep weight of bedding from feet by cradle and keep dependent parts elevated to control edema.

12. Discontinue Fischer's solution and do not flood with fluids in the early chronic phase, or the edema may recur.
13. For the outbursts of oozing on face or extremities try bland wet dressings (kept wet, but not dripping) and bandages or mask.
14. Keep detritus removed by the bath, but trim skin tags from palms and soles with scissors (don't allow patient to pull or tear).
15. Clipping the patient's hair close makes a cleaner scalp.
16. Local infections (abscesses, furuncles, broken-down lymph glands) must be watched for and promptly opened and drained.
17. Constipation in edematous patients may be handled by catharsis, but in others is better dealt with by enemas, forced fluids and fruit juices, olive oil per rectum to be retained, and coarsening of the diet if tolerated.
18. For the conjunctivitis, zinc-boric solution, or if purulent, 10 percent argyrol. Remove excess from lids to prevent local argyria.
19. For the lips, borated rose ointment. Keep the mouth clean and take out all removable dentures. If gingivitis and stomatitis are severe, treat as for mercurial stomatitis. Dental attention to gum pockets is very helpful.
20. Syringe out ears with warm boric solution occasionally and have excessive detritus removed instrumentally without trauma. Watch for furuncles.
21. Watch for decubitus and make every effort to prevent it, although it is not always preventable.
22. If diarrhea develops, use hot saline irrigations, provided blood and pus are present or ulcers can be recognized proctoscopically.
23. During convalescence reduce the scratching habit.
24. During convalescence increase the food intake and favor perspiration without chilling.
25. In protracted cases, with persistence of patches, short general exposures to ultraviolet light (quartz lamp) and intramuscular injections of the patient's own whole blood (10 cc once weekly) may be helpful. X-ray, unfiltered, in small doses under expert direction may be quite effective.
26. The use of insulin and glucose, calcium, sodium thiosulphate, and of liver extract is given on pages 448-453.

It may be well to amplify this treatment in a few particulars, describing in more detail some of the procedures.

The colloid bath is prepared by suspending 1 to 2 pounds of powdered corn starch or laundry starch in the ordinary tubful of water. For removal of grease or detritus the addition of one-half cupful of baking soda to the water, before the patient is placed in the tub, is helpful. The temperature of the water should be about 95° F. and the patient left in the tub for from 15 minutes to 1 hour.

Alkalinization, which is an important part of the treatment, may be carried out in several ways. Stokes favors the use of *potus imperialis*, which consists of 1 dram each of sodium citrate and potassium bitartrate, flavored with lemon or peppermint, in a glass of water. In emergencies Fischer's solution may be given intravenously and may also be used, where there is no necessity for haste, by proctoclysis.

Sodium thiosulphate is commonly used in the Navy and is apparently believed to have a definite place in the treatment of arsenical



poisoning. Opinions of syphilographers differ as to its efficacy. Moore says, "In spite of 7 years' experience with it (sodium thio-sulphate), I have seen no evidence that the drug is of any value whatever, either in arsphenamine dermatitis or in any other type of arsenical or heavy metal intoxication." While Stokes appears to be in some doubt as to its accomplishing all its endorsers claim for it, he thinks it should be used because of the striking benefits reported by some competent observers. He warns against its prolonged use and thinks that 3 or 4 injections will accomplish all that may be expected and further injections may be positively harmful in severe cases.

Calcium salts are recommended by several observers. Stokes administered it in large doses by mouth, giving 60 to 75 grains of the lactate of gluconate twice daily and also intramuscular injections of gluconate, 5 to 10 cc of a 10-percent solution one to three times weekly.

Moore has given daily intravenous injections of 10 cc of a 10-percent solution and has the impression it is of some value.

After recovery the question arises whether further arsenical treatment may be administered. The answer depends upon a number of factors, among them being the type and characteristics of the dermatoses.

Moore's summary of the types and essential characteristics of the post-arsphenamine dermatoses is:

*Types and essential characteristics of post-arsphenamine dermatoses*

Type of eruption	Special remarks	Evi- dences of vis- ceral damage associ- ated <sup>1</sup>	Expres- sion of perma- nent sensiti- zation	Further arsphenamine permissible
Urticarial.....	Part of angioneurotic reaction syndrome.	0	0	Yes.
Erythematous.....	Occurring early in treatment, sometimes after first or second dose. Accompanied by fever, but no other constitutional symptoms. Infectious in origin?	0	0	Yes, try different product in minute dosage.
Scarlatiniform.....	do.	0	0	Do.
Herpes simplex.....	Rare. Etiology unknown. Infection?	0	0	Yes.
Herpes zoster.....	Rare. Etiology unknown. Infection?	0	0	Do.
Macular (morbilliform).....	Beware of more arsphenamine if these eruptions are associated with marked itching or if the lesions tend to be scaly.	Unusual	± to +++++	Doubtful; use great caution
Maculopapular (erythematous-squamous).				
Papulovesicular.....	Different degrees of the same phenomenon. Potentially serious.	+ to +++++	+++++	No.
Vesicular.....				
Exfoliative.....	Probably a variety of the above.	?	+++++	Do.
Lichenoid.....		0	+++++	Yes, probably.
"Fixed" exanthems.....	Not enough information available as to course under prolonged treatment.			
Purpura.....	Associated with blood dyscrasias.	+++++	( <sup>2</sup> )	No.

<sup>1</sup> Especially renal damage, blood dyscrasias, or hepatitis.

<sup>2</sup> Not known but reactions prone to reoccur.

Among the methods employed in testing for arsenic sensitivity are the patch tests and the injection of small amounts of the drug. The patch test is performed as described by Stokes:

Three-tenths gram of neoarsphenamine is dissolved in 1 cc of distilled water. Bismuth arsphenamine sulphonate solution of the same concentration may be used as the test solution where this drug is suspected. A small linen patch is saturated with this test solution, applied to the intact skin of the arm and covered in turn with tracing cloth, bound down at the margins to form an air-tight chamber by adhesive tape. At the end of 24 hours the patch is removed and the first reading made. A strongly positive reaction consists of an acute dermatitis at the test site, *with vesiculation*. Partial positive reactions that show only erythema and a few papules are not regarded as evidence of definitely established cutaneous hypersensitiveness to the arsphenamines, only pronounced dermatitic reactions being regarded as clearly positive. After the inspection of the patch site 24 hours after application, the impervious dressing is removed and the site reinspected at the end of 24 hours, at the end of which time strongly positive reactions sometimes develop on exposure to air. The test site should be reinspected 48 hours after the impervious dressing is removed to recognize the last trace of "delayed positiveness." The test site of a strongly positive reaction usually returns to normal in about 3 weeks.

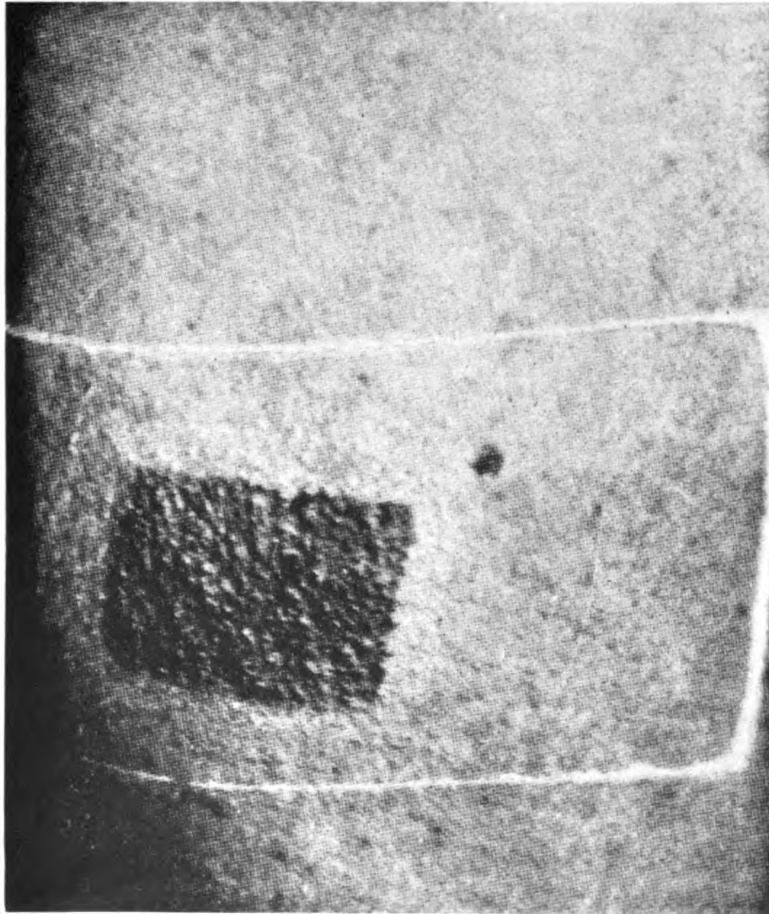
Testing for arsenical hypersensitivity by intravenous injections may be done as described by Moore:

After the reaction has completely subsided, and an additional interval of 2 to 3 months has been allowed to elapse, the patient's hypersensitivity may be cautiously tested out with minute doses of an arsphenamine given intravenously. A different product than that which caused the original reaction should be chosen, to allow for the possibility that the first accident may have been drug, rather than group, specific. The initial dose is very small, e.g., 0.025 gm., increasing by equally small increments until the patient's tolerance, or lack of it, is established. If the first attack was due to sensitization, the first or early injections of the trial series will be followed by (a) generalized itching, without a visible rash; (b) a mild dermatitis generally reproducing, though with less intensity, the characteristics of the first attack; (c) malaise—a "knocked-out" feeling—out of all proportion to the size of the dose injected, and persisting for several days; or (d) fever following each injection and lasting 24 to 48 hours or longer. If either of the latter two circumstances occurs, a white and differential blood count should be done. Leucopenia, a decrease in neutrophilic granulocytes, eosinophilia, or an increase in monocytes, indicates definite trouble. If any of these phenomena occur, the idea of further arsphenamine therapy at any time in the future must be permanently abandoned.

#### SUMMARY

In reviewing the reports of reactions sent to the Bureau of Medicine and Surgery by medical officers we have been impressed by the frequency with which indications of impending trouble have been recorded. While this series of 33 cases is too small to warrant final conclusions the findings strongly suggest the necessity for careful examination and questioning of patients.

Although the warning signs were included in the case histories they are repeated to emphasize their significance:



A POSITIVE PATCH TEST WITH NEOARSPHENAMINE, IN A PATIENT SENSITIVE TO THE DRUG. THE ERYTHEMATOUS PLAQUE IS STUDDED WITH VESICLES.

(From Modern Clinical Syphilology, Stokes, second edition. Courtesy W. B. Saunders Co., Philadelphia, Pa.)



*Case 77.*—Chills, fever, temperature 104° F., general malaise, headache, and coryza followed the injection preceding the one which caused a dermatitis.

*Cases 78 and 79.*—First injection after recovery from dermatitis caused recurrence of symptoms.

*Case 80.*—A 0.1-gm. injection after recovery from dermatitis caused a return of the rash.

*Case 51.*—Two reactions with aching followed injections preceding the one which caused dermatitis.

*Case 58.*—Nausea and headache after fourth injection. Dermatitis after seventh injection.

*Case 60.*—Pimples on forehead 4 days before injection which provoked dermatitis.

*Case 61.*—Several slight, but unreported, attacks of itching followed injections prior to the one which caused the dermatitis.

*Case 62.*—Exfoliative dermatitis in 1923 with recurrences without treatment in 1924 and 1927. Exfoliative dermatitis followed course of treatment in 1933.

*Case 63.*—High fever after injection preceding the one which caused dermatitis.

*Case 65.*—Urticaria in 1932. No treatment for 3 weeks, course being then completed without reaction. Urticaria after fourth injection of a course started 10 months later.

*Case 66.*—Acneiform eruption with itching 21 days after completion of first course. Another course of treatment was started in 14 days, and after each of five injections his skin condition was aggravated, finally resulting in exfoliative dermatitis.

*Cases 67 and 68.*—Macular dermatitis with desquamation followed first dose of second course. Two months after recovery a 0.25-gm. dose produced a generalized erythema.

*Cases 69, 70, and 71.*—Herpes followed first injection of first course, 1 week later itching erythema followed an injection, and 1 week later exfoliative dermatitis followed an injection.

*Case 72.*—Exfoliative dermatitis in 1931. An injection of 0.3 gm. 16 months later produced exfoliative dermatitis.

*Case 73.*—Fainted after fifth injection. Had abdominal cramps and felt shaky after succeeding six injections. Second course was begun 1½ months later and exfoliative dermatitis followed last injection of course.

*Case 81.*—Mild reaction after each of four injections of neoarsphenamine. Exfoliative dermatitis after second injection of silver arsphenamine.

*Case 50.*—This patient who died had noted a few vesicles about his lips and face before the injection which caused his death.

## HEALTH OF THE NAVY

The admission rate, all causes, based on returns for January, February, and March 1934, was 461 per 1,000 per annum. The corresponding median rate for the first quarter, 5-year period 1929-33, is 419. The general admission rate was slightly higher than expectancy, due to the greater than usual prevalence of acute respiratory infections, measles, and German measles at shore stations. The admission rate from disease was 405 and the 5-year median for the corresponding 3 months was 378. The annual rate per 1,000 from injuries and poisonings showed a decrease when compared with the rate for the previous quarter and an increase when compared with the 5-year median for the first quarter.

During the quarter, 1,409 cases of the common infections of the respiratory type and 301 cases of measles and German measles were reported from shore stations in the United States. The Naval Training Station, Norfolk, Va., reported that the cases admitted were mild with practically no complications. A list of the stations and the number of admissions recorded are shown in the following tabulation:

Station	January		February		March	
	Respiratory infections	Measles and German measles	Respiratory infections	Measles and German measles	Respiratory infections	Measles and German measles
Naval Academy, Annapolis, Md. (midshipmen).....	37	1	54	53	53	74
Naval Academy, Annapolis, Md. (other than midshipmen).....	25	0	19	0	19	0
Marine Barracks, Quantico, Va.....	35	0	39	2	59	16
Naval Air Station, Norfolk, Va.....	5	0	4	0	14	2
Naval Training Station, Norfolk, Va.....	93	0	95	3	152	85
Marine Corps Base, San Diego, Calif.....	7	0	7	4	13	1
Naval Air Station, San Diego, Calif.....	7	0	23	2	12	0
Naval Training Station, San Diego, Calif.....	201	25	131	12	76	11

Shore stations outside the continental limits of the United States reported 324 cases of these diseases for the quarter, as follows: Hawaii, 53; Panama Canal Zone, 56; Philippine Islands, 14; Guam, 3; Guantanamo Bay, Cuba, 11; China, 151; Haiti, 28; and Samoa, 8. The Monthly Sanitary Report for February from the Regimental Hospital, Fourth Marines, Marine Corps Expeditionary Force, Shanghai, China, stated that "during the greater part of the winter and especially during February a large number of acute respiratory cases were reported. However, due to prompt hospitalization none of these developed pneumonia."

There appears to have been more than the expected incidence of mumps at the Naval Training Station, San Diego, Calif., as sug-

gested by the notification of 15 cases in January, 7 in February, and 1 in March, making a total of 23 cases for the quarter. Twelve cases of mumps were also reported from the Regimental Hospital, Fourth Marines, Shanghai, China, 1 in January, 7 in February, and 4 in March.

Eight cases of chickenpox were reported, 1 from Marine Barracks, Quantico, Va., in February; 1 from the Navy Yard, Philadelphia, Pa., in January; 2 from the Naval Air Station, Norfolk, Va., in March; 1 from the Navy Yard, Charleston, S.C., in February; 2 from the Naval Air Station, Pensacola, Fla., 1 in January and 1 in February; and 1 from the Regimental Hospital, Fourth Marines, Shanghai, China, in March.

The admission rate, all causes, for forces afloat was 396 per 1,000. The rate for the preceding quarter was 405 and the median for the preceding 5 years was 390. A total of 873 cases of catarrhal fever was notified from all ships for the quarter.

Only 10 ships had 30 or more cases of acute respiratory infections distributed over the quarter, as follows:

Ship	January	February	March
U.S.S. Saratoga (including fleet air base, San Diego, Calif.).....	31	26	31
U.S.S. Mississippi.....	32	33	15
U.S.S. New Mexico.....	30	27	19
U.S.S. Henderson.....	25	14	26
U.S.S. Wyoming.....	14	32	6
U.S.S. Oklahoma.....	11	23	15
U.S.S. Arkansas.....	18	14	14
U.S.S. Idaho.....	2	7	34
U.S.S. Colorado.....	15	7	13
U.S.S. Northampton.....	10	17	5

Two cases of chicken pox were reported from the U.S.S. *Mississippi*, 1 in January and 1 in February. There were 3 cases of scarlet fever notified, 1 in January from the U.S.S. *New Mexico*, 1 in February from the U.S.S. *New York*, and 1 in March from the U.S.S. *California*. The U.S.S. *West Virginia* reported 1 case of diphtheria in March.

The following résumé of mortality for 1933 was abstracted from the Battle Force Medical Bulletin for the month of January 1934:

The total number of deaths among the personnel of the battle force for the calendar year 1933 was 77, an increase of 20 over that for the year 1932. The causative agents were: Disease, 17; airplane accidents, 13; motor vehicles, 22; suicides, 10; homicides, 3; drownings, 4; other accidents, 8. The number of deaths due to motor vehicle accidents (22) has been identical for 3 successive years.

**TABLE 1.—Summary of morbidity in the United States Navy for the quarter ended Mar. 31, 1934**

	Forces afloat		Forces ashore		Entire Navy	
	71,917		34,272		106,189	
	Admis- sions	Rate per 1,000	Admis- sions	Rate per 1,000	Admis- sions	Rate per 1,000
Average strength.....						
All causes.....	7,113	395.62	5,124	598.04	12,237	460.95
Disease only.....	6,149	342.01	4,599	536.76	10,748	404.86
Injuries.....	948	52.73	521	60.81	1,469	55.34
Poisonings.....	16	.89	4	.47	20	.75
Communicable diseases, exclusive of venereal diseases:						
(A).....	149	8.29	192	22.41	341	12.85
(B).....	1,573	87.49	1,562	182.31	3,135	118.09
Venereal diseases.....	1,881	104.62	464	54.15	2,345	88.33

**TABLE 2.—Deaths reported, entire Navy, during the quarter ended Mar. 31, 1934**

		Navy			Marine Corps		Nurse Corps	Total
		Offi- cers	Mid- ship- men	Men	Offi- cers	Men		
Average strength.....		9,317	1,639	78,564	1,168	15,126	375	106,189
Cause—Disease								
Primary	Secondary or contributory							
Abscess:								
Liver.....	None.....					1		1
Scalp.....	Septicemia.....					1		1
Aortitis, chronic.....	Myocarditis, chronic.....			1				1
Appendicitis, acute.....	Abscess, lung.....			1				1
Do.....	Peritonitis, general, acute.....			1				1
Do.....	Peritonitis, local, acute.....			1				1
Arteriosclerosis, general.....	Thrombosis, coronary artery.....			1				1
Do.....	Infarction, heart.....	1						1
Carcinoma:								
Breast.....	None.....						1	1
Liver.....	do.....	1						1
Neck.....	do.....			1				1
Diverticulitis, cecum.....	Peritonitis, local, acute.....				1			1
Encephalitis, lethargic.....	None.....			1				1
Glioma:								
Brain.....	Hemorrhage, cerebral artery.....			1				1
Lymphangioma, axilla.....	None.....	1						1
Nephritis, acute.....	Uremia.....			1				1
Obstruction, intestinal, from external causes.....	None.....					1		1
Pancreatitis, acute.....	do.....			1				1
Do.....	Peritonitis, general, acute.....			1				1
Pneumonia, broncho.....	None.....			1		1		2
Do.....	Meningitis, cerebrospinal, acute.....			1				1
Do.....	Pleurisy, suppurative.....	1						1
Pneumonia, lobar.....	None.....			7				7
Rheumatic fever.....	Endocarditis, acute ulcerative (malignant).....			1				1
Syphilis.....	Poisoning, neosarsphenamine, acute.....			2				2
Thrombosis, coronary artery.....	None.....			1	1			2
Tonsillitis, acute.....	Endocarditis, acute ulcerative (malignant).....			1				1



TABLE 2.—Deaths reported, entire Navy, during the quarter ended Mar. 31, 1934—Continued

		Navy			Marine Corps		Nurse Corps	Total
		Offi- cers	Mid- ship- men	Men	Offi- cers	Men		
Average strength.....		9,317	1,639	78,564	1,168	15,126	375	106,189
Cause—Disease								
Primary	Secondary or contributory							
Tuberculosis, meninges.....	Tuberculosis, kidney.....			1				1
Tuberculosis, pulmonary chronic.....	None.....			1				1
Do.....	Pneumopyothorax.....			1				1
Do.....	Tuberculosis, intestine.....			1				1
Do.....	Tuberculosis, kidney.....			1				1
Tumor, malignant, mixed, cecum.....	Peritonitis, general, acute.....					1		1
Ulcer:								
Duodenum.....	None.....				1			1
Stomach.....	Hemorrhage, gastric.....				1			1
Valvular heart disease, combined lesions, aortic and mitral.....	None.....					1		1
Total for disease.....		4		30	4	6	1	45
Injuries and poisonings								
Asphyxiation, illuminating gas.....	None.....			1				1
Drowning.....	do.....	1		3				4
Electric shock, injury from.....	do.....			2				2
Fracture, compound, skull.....	do.....			2				2
Do.....	Hemorrhage, intracranial.....	1						1
Injuries, multiple, extreme.....	None.....	1		5		2		8
Strangulation, neck.....	do.....					1		1
Wound:								
Gunshot, chest.....	do.....			1				1
Gunshot, head.....	do.....					2		2
Incised, neck.....	do.....			1				1
Lacerated, chest and lungs.....	Hemorrhage, pulmonary and pericardial.....			1				1
Punctured, heart.....	None.....					1		1
Total for injuries and poisonings.....		3		16		6		25
Grand total.....		7		46	4	12	1	70
Annual death rate per 1,000:								
All causes.....		3.01		2.34	13.70	3.17	10.67	2.64
Disease only.....		1.72		1.53	13.70	1.59	10.67	1.70
Drowning.....		.43		.15				.15
Poisonings.....		0	0	0	0	0	0	0
Other injuries.....		.86		.66		1.59		.79

## ADMISSIONS FOR INJURIES AND POISONINGS, FIRST QUARTER, 1934

The following table, indicating the frequency of occurrence of accidental injuries and poisonings in the Navy during the first quarter, 1934, is based upon all form F cards covering admission in those months which have reached the Bureau:

	Admissions, January, February, and March 1934	Admission rate per 100,000, per annum	Admission rate per 100,000, year 1933
<b>INJURIES</b>			
Connected with work or drill.....	583	2, 196	2, 237
Occurring within command but not associated with work.....	441	1, 661	1, 692
Incurred on leave or liberty or while absent without leave.....	445	1, 676	1, 757
All injuries.....	1, 469	5, 533	5, 686
<b>POISONINGS</b>			
Industrial poisoning.....	4	15	26
Occurring within command but not connected with work.....	13	49	191
Associated with leave, liberty, or absence without leave.....	3	11	19
Poisonings, all forms.....	20	75	236
Total injuries and poisonings.....	1, 489	5, 608	5, 922

*Percentage relationships*

	Occurring within command				Occurring outside command—leave, liberty, or A.W.O.L.	
	Connected with the performance of work, drill, etc.		Not connected with work or prescribed duty			
	January, February, and March 1934	Year 1933	January, February, and March 1934	Year 1933	January, February, and March 1934	Year 1933
Percent of all injuries.....	39.7	39.3	30.0	29.8	30.3	30.9
Percent of all poisonings.....	20.0	10.9	65.0	80.9	15.0	8.2
Percent of total admissions, injury and poisoning titles.....	39.4	38.2	30.5	31.8	30.1	30.0

Poisoning by a narcotic drug or by ethyl alcohol is recorded under the title "Drug addiction" or "Alcoholism", as the case may be. Such cases are not included in the above figures.

There were no cases during the first quarter of 1934 worthy of notice from the standpoint of accident prevention.

**STATISTICS RELATIVE TO MENTAL AND PHYSICAL QUALIFICATIONS OF RECRUITS**

The following statistics were taken from monthly sanitary reports submitted by naval training stations:

January, February, and March 1934	U.S. Naval Training Station	
	Hampton Roads, Va.	San Diego, Calif.
Recruits received during the period.....	1, 941	1, 197
Recruits appearing before Board of Medical Survey.....	42	0
Recruits recommended for discharge from the Service.....	42	0
Recruits discharged by reason of medical survey.....	21	0
Recruits held over pending further observation.....	8	0
Recruits transferred to the hospital for treatment, operation, or further observation for conditions existing prior to enlistment.....	17	42

The following table was prepared from reports of medical surveys in which disabilities or disease causing the surveys were noted as existing prior to enlistment. With certain diseases, survey followed enlistment so rapidly that it would seem that many might have been eliminated in the recruiting office.

Cause of survey	Num-ber of surveys	Cause of survey	Num-ber of surveys
Absence, acquired, rib.....	2	Foreign body, right radius.....	1
Absence, acquired, teeth.....	2	Gonococcus infection, urethra.....	4
Adhesions, peritoneum.....	1	Hernia, inguinal.....	7
Arterial hypertension.....	1	Hypermetropia.....	1
Astigmatism.....	2	Insufficiency, ocular muscle.....	2
Atrophy, muscles, forearm.....	1	Malformation, congenital, spine.....	1
Color blindness.....	3	Malocclusion, teeth.....	1
Constitutional psychopathic inferiority.....	12	Myopia.....	3
Contusion, dorsal spine.....	1	Drug addiction.....	1
Deafness.....	2	Nostalgia.....	1
Deformity, left elbow.....	1	Osteoma, left femur.....	1
Deformity, left leg.....	1	Osteoma, left ischium.....	1
Deformity, right thigh.....	1	Otitis, media, chronic.....	2
Deviation, nasal septum.....	2	Perforated nasal septum.....	1
Diabetes mellitus.....	2	Psychoneurosis, hysteria.....	2
Dislocation, articular cartilage, knee.....	1	Rhinitis, atrophic.....	1
Eczema.....	1	Stammering.....	1
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